SCHOOL AND HOME GARDENS

MEIER

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A SCHOOL GARDEN IN JUNE

(See p. 235)

SCHOOL AND HOME GARDENS

BY

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PREFACE

This book gives definite instructions for arranging, planting, and caring for plants commonly grown in the house, yard, and garden. It tells how to do things in such a way that good results will be obtained. It is not a book of experiments, nor does it deal with generalities. The difficulties confronting the student in cultivating each individual plant are considered, one at a time, and definite directions for meeting them are given. The various planting directions given in the book have been tested repeatedly by the author in his home gardens, and by pupils in school gardens under his personal directions. While designed especially to be used as a textbook for grammar grades, "School and Home Gardens" will serve also as a handbook for the home gardener. In districts where there are no school gardens, instructions may be given at school and the lessons put into practice at home. Primary and intermediate grade teachers will find in it ample material from which they may select for their grades.

The numerous drawings and photographs have been made expressly for this book, under the personal supervision of the author. The pen drawings are by C. H. L. Gebfert and F. Schuyler Mathews; the planting plans by S. A. Arnold; the photographs by Newcomb & Robinson, Robert Cameron, G. W. Cokell, and Arden Nortrup.

The author is grateful for the help given him by Robert Cameron, head gardener, and Oakes Ames, director, of the

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Botanic Garden of Harvard University; also for assistance from Dr. C. G. Hopkins, Professor of Agronomy, University of Illinois; Dr. W. J. V. Osterhout, Professor of Botany, and B. M. Watson, Instructor in Horticulture, both of Harvard University; and Joseph N. Campbell, a practical gardener at Sanger, California.

Among the books that have been useful to the author in his garden work are the following: "The Home Vegetable Garden," Rockwell; "The Woman's Hardy Garden," Ely; "Garden-Making" and "The Vegetable Garden," Bailey; "Experiments with Plants," Osterhout; "How to make School Gardens," Hemenway; "Soil Fertility and Permanent Agriculture," Hopkins; "How to plan the Home Grounds," Parsons; "Familiar Flowers of Field and Garden," F. Schuyler Mathews; "Garden Guide," Henderson; "How to grow Vegetables," French; "Trees, Shrubs, Vines, and Herbaceous Perennials," Kirkegaard; "New Manual of Botany," Gray; also numerous state and national government bulletins.

Suggestions from teachers and gardeners toward the improvement of subsequent editions are cordially invited.

W. H. D. MEIER

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SCHOOL AND HOME GARDENS

CHAPTER I

THE WINDOW GARDEN

Conditions required for window plants. In every schoolroom one window should be reserved for plants. They may be placed on the window sill, on a shelf in front of the window, or on a table. A window near the front of the room is best. Here the plants may be seen at any time by every one in the room, and the extra floor space gives more opportunity for working. It is advisable to have each room equipped with a table that can be easily moved, so that a number of pupils may use it at the same time. On very cold nights the plants may be placed on this table and moved away from the window.

Light is necessary to the life of all plants; they cannot develop without it. Such plants as geraniums, petunias, lilies, and roses require strong sunlight. Begonias, abutilons, nicotianas, daisies, coleus, and ferns may be grown successfully where there is an abundance of light, but they do not require much direct sunlight; they should be selected for rooms having north windows. Palms and India-rubber plants do well without direct sunlight and will thrive in a hall or on a stair landing.

Aspidistras, sometimes known as "iron plants" on account of their hardiness, will thrive in the shaded corner of any schoolroom.

Light-loving plants, whether they require strong sunlight or diffused light, should be placed near the

FIG. 1. A Boston Fern and a Palm in a Schoolroom

windowpane, so that they may receive all the light possible. This is of great importance during their early growing stage. Much of the subsequent success depends upon the health and vigor acquired during this stage. Crowding must be avoided; two or three plants in a window with room to develop are worth more than a dozen which are obliged to struggle for existence.

If plants are to develop symmetrically, they must be turned frequently, but it is usually best to let the leaves occupy the same position with reference to the light from day to day. Plants will not thrive if they are changed so that strong sunlight falls on the underside of the leaves.

Fresh air containing the required amount of moisture is as important for plants as for children; neither can be kept in health without it. But drafts must be avoided; no cultivated plant can be submitted to a draft for any length of time without injury to its foliage or blooms. Special care must be taken in the spring, when the weather may change completely in the space of an hour.

In most schoolrooms the dryness of the air, caused by artificial heat, must be counteracted by keeping the water pan in the furnace air chamber well filled. In the case of steam-heated rooms the normal amount of moisture may be obtained by allowing steam from the radiator valves to escape at intervals.

Dry heat absorbs the moisture from the foliage, and the fine dust that is always afloat in the excessively dry schoolroom atmosphere fills the stomata (the openings on the underside of the leaves, through which they obtain air) and causes the plants to become sickly and subject to the attack of insects.

The ordinary temperature of from sixty-eight to seventy degrees, which may go as low as fifty overnight, is suitable for nearly all house plants. Large school buildings should never be permitted to have a lower

temperature than fifty degrees. Even if an effort be made on Sunday evening to raise the heat of a schoolhouse, the extra amount of extremely hot air needed to obtain the proper temperature will create an unfavorable condition for either children or plants on Monday morning. Although hot air forced into a very cold room may cause the thermometer to register sixty-eight degrees when hanging against a casing four or five feet above the floor, this does not prove that the floor and furniture have the proper temperature.

CHAPTER II

THE GROWING OF BULBS IN GLASSES

The Chinese Sacred Lily

The Chinese sacred narcissus, commonly known as the Chinese sacred lily, may be easily grown in water in any schoolroom or home window. The number of flower stalks that come from a single bulb and the number of flowers on a stalk, as well as the healthful appearance of the foliage, depend upon the quality of the bulb, the care it receives, and the condition of the room. Much interest will be aroused in their culture if bulbs are started in different rooms of the same building at one time.

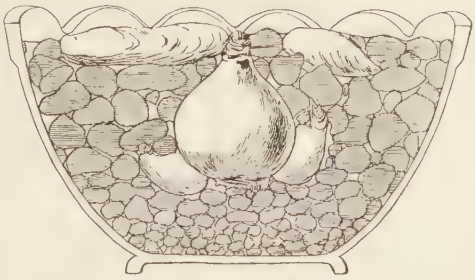


Fig. 2. A Vertical Section of a Dish, showing Method of planting the Chinese Sacred Lily

A glass dish three inches deep and six inches in diameter is large enough for one bulb with three or four small ones attached to it. If there are no small bulbs attached to the larger one, two bulbs may be used. The small ones should be left attached to the large bulb, even if they reach well down into the bowl. Blooms may

be expected from all of them. The bulbs may be started at any time from September to December, but they are in the best condition when they first arrive in the

FIG. 3. Chinese Sacred Lilies
Two bulbs were planted in an eight-inch dish

market. On account of the dry atmosphere in which they are usually kept, the later bulbs lose strength.

Place a layer of one inch of coarse pebbles in the bottom of the dish and on this arrange the bulbs. If the side bulbs reach below the level of the large bulb, put pebbles under and around it so that it will stand

up straight. Continue packing in pebbles until the dish is filled, but care must be taken that the side bulbs have an opportunity to work their way up. Four or five slits about one fourth of an inch deep, cut down the sides of the large bulb near the top, will aid the weak shoots to burst through the tough outer skin.

Put enough water into the dish to cover the lower part of the bulb. More may be added from day to day as the small bulbs make their way up. Overflow the dish with fresh, warm water every day or two by letting it flow gently in on one side and out on the other, so that all the water will be changed. The blooming period will be hastened if tepid water is used each morning. Keep the dish in a warm place, where the sun does not reach it, for two or three weeks; then give it an abundance of sunlight.

Fig. 4. Roman Hyacinths growing in Glasses

The giant golden sacred lily and the paper-white narcissus may be grown under the same treatment as the Chinese sacred lily. If the bulbs are small, as many as half a dozen may be placed in a single dish. Place small bulbs near

the top of the dish and use finer pebbles than for the Chinese sacred lily. Keep them in weak light until the flower stalks are well developed.

Culture of hyacinths in glasses. Single varieties are best adapted for growing in glasses. Roman hyacinths may be placed in glasses in September, the other varieties at intervals during October and November. Use rain water and place a piece of charcoal in the glass to keep the water pure. Place the bulb so that the base is just in contact with the water until roots are formed; then leave an air space of a quarter of an inch between the base of the bulb and the water. Without the air space the bulb will decay. Keep the glass in a cool, dark closet for two weeks, until roots are formed, and then expose it to the light and air. Change the water every two or three days. The bulbs of plants that have been grown in water will be of no further use.

CHAPTER III

THE GROWING OF PLANTS IN POTS

Tulips

The soil must be loose so that the roots can work down easily. A good bulb soil is made from a mixture of one part clean sand, one part coarse manure, and two parts garden soil, or from a mixture of one part clean sand and three parts soil containing rotted sod.

The single tulips should be used for potting. They can be brought to flower more easily than the double varieties. Plant them in flowerpots, bulb pans, or boxes. Five bulbs may be put into a six-inch pot; a ten-inch bulb pan is large enough for a dozen bulbs.

Put a layer of pebbles or broken pieces of flowerpots over the entire bottom of the pot to a depth of half an inch, then put soil into the pot to within two inches of the top. Arrange the bulbs in rows and begin planting the row farthest from you. After all have been put in place, fill soil around the bulbs and press it down with the fingers. The soil should just cover the tips of the bulbs after it has been made firm. This will leave a space of half an inch or more for holding water. Water the bulbs thoroughly with a sprinkler. They are now ready to be put away while forming roots.

Bulbs have two distinct periods of growth: they must first form roots and later leaves and flowers. The

Fig. 5. Single Tulips

success of the latter depends entirely upon the strength of the roots. During the rooting period they may be placed in a dark corner of a cool cellar or buried in

a trench in the yard or garden. Packing them with leaves in a cold frame is an excellent way to keep them. Bulbs that are kept in a cellar must be examined from time to time. If the soil becomes dust dry, they should be given a little water. After the tops appear an inch or more above the soil, the supply of water may be increased. During the rooting period they must be

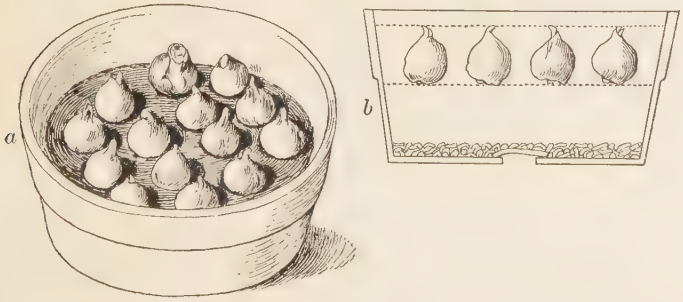


FIG. 6. Tulip Bulbs

a, bulbs arranged in a pan; *b*, vertical section of a bulb pan, with dotted lines showing depth to which bulbs should be covered

kept out of the light. After flower stalks begin to form they must be brought to the light gradually.

If the bulbs are to be kept out of doors, dig a trench about fifteen inches deep near a fence or at the edge of a border, where it can be covered without being in the way. Put a layer of leaves two inches deep in the bottom of the trench; on this put the pots. Before the pots place markers made of laths having the names of the bulbs written on them, so that they may be read above-ground after the trench is filled. Then pack leaves around and over the pots and fill the trench with soil.

After the ground freezes, cover it with leaves or straw to a depth of five or six inches. This cover may be held down with strips of board or with brush.

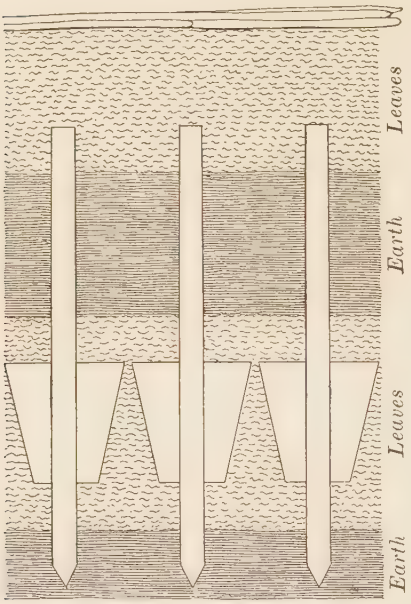


FIG. 7. Cross Section of a Trench, showing Method of keeping Bulbs through the Winter for Spring Blooming

Names of the variety in each row of pots may be placed on the markers

Pots may be taken from the trench at any time from February until spring when the ground is not frozen too hard. When they are taken up, a hole should be dug in front of the markers. Lift the soil carefully away from above the pot wanted, so that young shoots which have started will not be injured. Water them and bring to warmth and light gradually.

The narcissus, hyacinth, scilla, snowdrop, and crocus may all be potted successfully in the fall. A six-inch pot is suitable for three large narcissi or hyacinths. A five-inch pot is large enough for six scillas. Crocuses and snowdrops need thick planting; two dozen bulbs can be put into an eight-inch bulb pan. Use the directions given for the planting and care of tulips.

If the results are unsatisfactory it is usually owing to the fact that the bulbs are brought to the light too suddenly. They must be kept in subdued light until the flower head can be seen distinctly, when they may be given sunlight to hasten blooming. Hyacinths should not have strong sunlight until after the stem beneath the flower head can be seen. It will help the hyacinth if the flower stalk is protected with a paper tube until the flowers are ready to open. Tulips, crocuses, and narcissi need strong sunlight; the other bulbs will give excellent results in north windows.

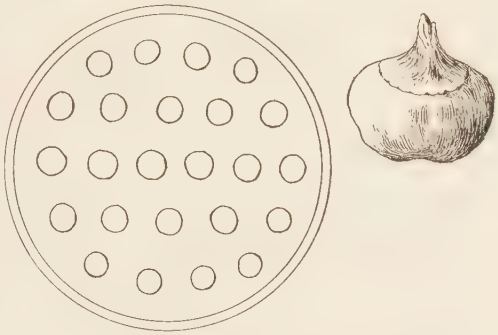


Fig. 8. Diagram showing Method of placing the Solid Bulb of Crocus, called Corm, in a Pot

After the bulbs are done blooming, the leaves may be permitted to die down gradually. If they are kept in a dry, cool place during the summer and planted in beds or borders in the fall, some of them will bloom the next spring.

Early bulbs. The Roman hyacinth, the polyanthus narcissus, and the freesia may be potted early in September and brought to bloom in November or December. Six Roman hyacinths or four narcissi may be put into a five-inch pot. Keep them in a cellar, basement, or storeroom in subdued light until the flowers are ready

to open. Give them plenty of water. Bring the plants to the light and sunshine gradually.

Having learned the method of potting bulbs, pupils may be given some to pot at home. The kinds of bulbs used for this purpose may vary in different rooms, but it is advisable to let a number of pupils experiment with the same kind. Some will find it convenient to store them in cellars, others in cold frames, and some will find it necessary to put them into a trench. Flowers from the late bulbs may be expected in February and March. Results will vary all the way from brilliant success to absolute failure. This will give an opportunity to consider the conditions under which the plants have been grown, and to work out a successful method of culture. It will also provide plants for the schoolroom window.

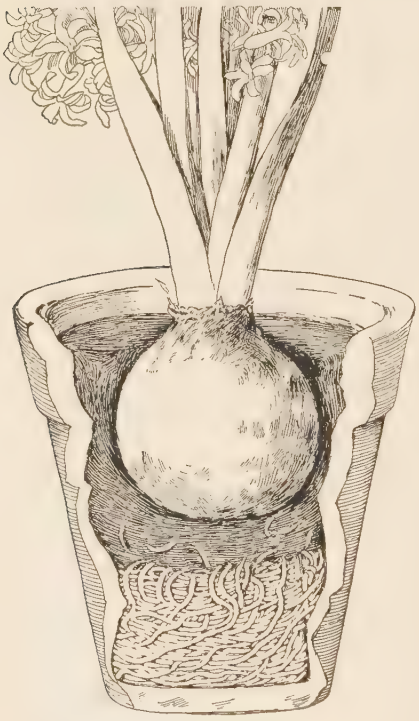


Fig. 9. A Hyacinth Bulb that formed Strong Roots while it was in the Dark

The Calla

The calla is a plant that can be easily grown, but the degree of success will depend largely upon the attention it receives. Three strong bulbs planted in an eight-inch pot in September should give a succession of blooms for several months during the winter. When the plants are not in bloom the foliage will make a neat and attractive appearance in any window, if the plant is kept clean and in a healthy condition. The small varieties are best for either schoolroom or home windows. Select three-year-old bulbs. The bulbs can be used from year to year; the large, strong ones will give the best results.

Fig. 10. A Calla Plant

Prepare the compost for potting the bulbs by mixing equal parts of well-rotted barnyard manure, garden soil,

and sand. If the mixture is coarse, pass it through a quarter-inch screen. Coarse pieces of manure may be broken by rubbing them on the screen.

Over the hole in the bottom of the flowerpot place a piece of broken pot or crockery, with the hollow side down; then put in at least an inch of broken stone or pebbles, for drainage. On this place a layer of two inches of well-rotted barnyard manure, which should be well broken. Then fill soil into the pot so that the bulbs are within one inch of the top after a half-inch layer of sand is put under them. Press down the soil and sand. Place the bulbs in the form of a triangle and press soil around them, leaving the tops barely covered. With a garden sprinkler water the pot thoroughly and set it aside for roots to form. Any place in the schoolroom or in a storeroom will answer the purpose. Callas need not be in sunlight until after growth really begins. Give them very little water during the root-forming period, but gradually increase the amount as the buds appear.

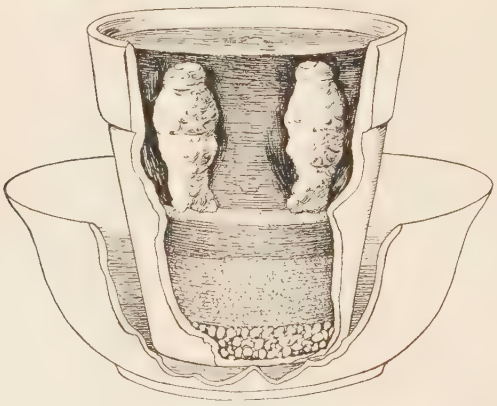


Fig. 11. A Section of a Flowerpot containing Calla Bulbs

After the buds have grown to a height of about two inches, bring them to a window and give them plenty of sunlight. Instead of the usual saucer use a granite-iron pan or a half-gallon crock to catch the drainage. Water the plant each morning, putting enough water into the pan or crock so that the pot will stand in water to a depth of about two inches. When the leaves begin to form, hot water will help bring out the blooms. Keep the pan or crock clean by washing it frequently. Plants may be watered from above in the ordinary way, but hot water will injure the stems if it comes in contact with them. Occasional applications of liquid manure will make the plants more thrifty after they begin to bloom. After applying the manure, water well from above so that the nourishment will soak down to the roots.

FIG. 12. A Calla in the Corner of a Garden during its Resting Period in the Summer

In May or June turn the pot on its side in the shelter of a shrub in the yard or garden. The plants should be kept dry until September, when they will be ready for repotting. Shake the soil out of the bunch and remove all roots and the bulblets that may have formed on the sides of the large bulb. Wash the pot and drainage material and plant the bulbs in a new supply of manure and soil.

The bulblets will produce plants that will flower the second year, but they will not be prolific bloomers until the third year. Space in a schoolroom window is too valuable to wait so long for results. If pupils can find room for them at home, the experience of bringing them to bloom will be valuable and interesting. Only the strongest bulblets should be used. A five-inch pot will be large enough for three of them. Plant in the same way that the larger bulbs are planted, and give them the attention usually given to window plants.

The Easter Lily

Any one who has had some degree of success in cultivating bulbs may try the Bermuda lily (*Lilium harrisii*), generally known as the Easter lily. Use the same kind of soil as for other fall bulbs. Select large bulbs; the smaller ones will bloom, but they seldom give satisfactory results. One bulb may be put into a six-inch pot, or three may be planted in a ten-inch pot. Place the bulbs so that the tops will be three inches below the edge of the pot; fill soil around them firmly and barely cover the tops of the bulbs. This lily produces two sets of roots: One set comes from the base of the bulb; it furnishes nutriment for the development of the plant. The other set is thrown from the stalk sent up by the bulb; the office of this set is to provide support for the plant. After the plants are taken from storage, soil should be filled in around the stems until each pot is

nearly full. This will give the stem roots an opportunity to penetrate the soil for support. Stakes will seldom be needed if this method is followed carefully.

After planting, water the bulbs thoroughly with a sprinkler, cover, and put in a cool place for storage, like other bulbs, but do not allow them to freeze. Roots should form in ten or twelve weeks and the bulbs should then be kept in a cool place where they may grow slowly for another ten or twelve weeks. At the end of this time they may be placed in a warm room for blooming. Liquid manure may be applied freely when the plants are in bud.

Fig. 13. An Easter Lily in a Home Window

The plants should be encouraged to make a thrifty growth after blossoming. Let them die down gradually. Each pot may then be laid on its side out of doors until fall, when the bulbs should be shifted to pots one size larger. Pick the pebbles away from the ball of roots but do not pull it apart. After placing drainage material in a pot, cover with a half-inch layer of sand and a small quantity of soil; on this place the bulb with its unbroken mass of roots and fill soil around it firmly.

Propagation of House Plants

Cuttings. Stem cuttings of herbaceous wood, such as geranium, coleus, and plants of similar nature, are known as slips. Those from three to four inches in length, taken from the ends of new shoots, are best; they should have at least two nodes aboveground and one below. The slip should be removed from the plant with an upward-drawing motion of a sharp knife. Take off the slip just below a node and trim back the wood on the stock from which it has been removed, to the first node below. That part of the stem above the node, if not removed, is likely to decay and infect other portions. Parts of young stems that are not taken from ends of shoots may be used if the wood is trimmed back to the first bud.

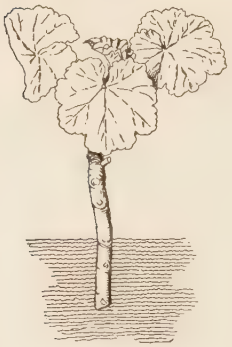


Fig. 14. A Geranium Slip in Soil

Reduce the foliage one half by cutting off either entire leaves or parts of large leaves. Always remove the leaves with an upward motion of the knife. If the parts are taken off with a clean cut, the wound will heal more easily than when ragged edges are left.

Materials needed. The materials needed are well-rotted barnyard manure, leaf mold, soil, sand, small stones or broken pieces of flowerpots, six-inch flowerpots that are four or five inches deep, and china or granite-iron plates or indurated-fiber flowerpot saucers

Fig. 15. A Table for growing Plants from Cuttings

to receive the drainage from the pots. Wooden boxes, eighteen inches long, six inches deep, and six inches wide, provided with zinc trays for the purpose of catching the drainage, may take the place of the flowerpots.

Preparing the soil. With a screen that has a quarter-inch mesh, screen separately manure, soil, and sand; then mix them thoroughly so that the mixture will contain one third of each.

Place broken pieces of stone over the entire bottom of the flowerpot to a depth of half an inch. If care is taken not to close the hole in the bottom of the pot,

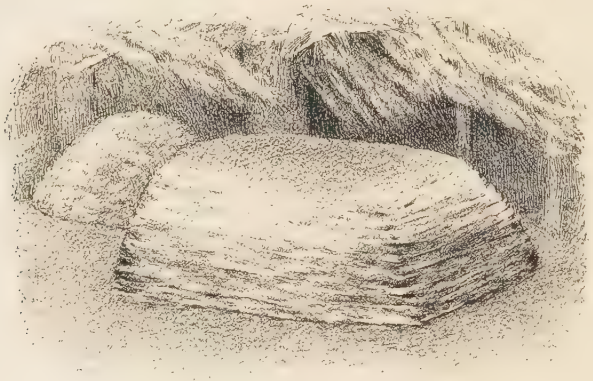


Fig. 16. Leaf Mold and Sod

The leaves should be placed in a heap and covered with manure or soil. Cut the sod two or three inches deep and place the pieces upside down, layer upon layer

this layer will provide ample drainage. Over the drainage layer place half an inch of small pieces of broken sod or leaf mold, to help hold the moisture and prevent the sand and soil from passing out of the opening in the bottom of the pot. Sphagnum moss, which may be obtained from dealers in garden seeds or from greenhouses, is excellent for retaining moisture. Press the layer down firmly and place over it one inch of the prepared soil. This will give nourishment to the cuttings

after they have formed roots. Finally, put in moist sand and pack closely until the pot is filled to within one fourth of an inch of the top; then water thoroughly with a garden sprinkler.

Planting slips. A stick, called a dibble, about six inches long and having its diameter a little larger than that of the slips to be planted, should be used to make the holes. For geranium slips four inches in length make holes two inches deep, in rows one and one-half inches apart, straight across the pot. Make the holes one and one-half inches apart in the row, but let them alternate with those in adjacent rows. The holes may be close to the sides of the pot, but they should be made so that the slips will stand vertically after planting. Have all the slips prepared and sorted before beginning to plant. Place small ones on the outside and large ones in the center of the pot so that the whole will have a neat appearance after the work is completed.

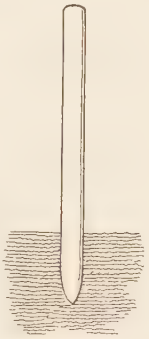


FIG. 17. A Dibble

Begin planting in the holes farthest away. The slips should reach to the bottom of the holes, and the edges must not be injured. With a finger on each side of the slip, press the soil down firmly. By planting across the pot and setting the slips in the rows farthest away first, the danger of loosening those already in place is reduced to a minimum. This method also makes it easier to grade the sizes.

Water the pot thoroughly after all the slips have been planted. The sprinkler should be held at some distance above the pot, so that the water will come down with some degree of force and cause the sand to settle around the slips. The pot is now ready to be placed in a window. A china plate or a granite-iron or fiber pan should be put under it to catch the drainage. The ordinary clay saucers used under flowerpots are so porous that they allow moisture to pass through and injure the window sill or the table.

Geranium slips will do well in the usual house temperature of from 68 degrees to 70 degrees Fahrenheit. They should be watered daily, but water must not be permitted to stand in the pan, thus keeping the soil soaked. Protect from strong sunlight for several days.

Leave the slips in the pot until they have grown two or three inches, when they may be transplanted to three-inch flowerpots and distributed among the pupils. If an attempt is made to start a slip for each pupil in the room, there must be several extra ones, as some usually fail to grow.

Potting Plants

Geraniums grown from slips. The materials needed are four-inch flowerpots, pebbles for drainage, and fine soil consisting of equal quantities of garden soil, well-rotted manure, and sand. After the compost is well mixed it should be passed through a quarter-inch screen, in order that all the lumps in it may be removed or broken. The

soil should contain some moisture, but not enough to make it stick to the hand. If the pots are new, soak them before using; old pots should be washed. The plants must be well watered two or three hours before transplanting.

Place a layer of pebbles in the pot, then half an inch of the coarse material that would not pass through the screen. Add enough soil so that the pot will be half full after it is well packed. With a table knife lift a plant from the pot in which the slips have been growing, taking up as much earth on the roots as possible. Set it in the middle of a four-inch pot and fill in with soil. Push the soil down with the thumbs so that the plant will be between them. Give it an even pressure on all sides, taking care to disturb the roots as little as possible while the soil is being packed in firmly. Leave half an inch at the top for holding water. Water the plant with a garden sprinkler and set it in the shade for several days.

Fig. 18. Section of a Flowerpot containing a Geranium Plant

Repotting geraniums. Geraniums bloom best in small pots, but plants that have been growing in four-inch

pots should be shifted to pots a size larger the second year. Geraniums in five-inch pots are excellent for schoolroom windows. They will form roots enough to grow considerable foliage and will also bloom well. If large plants are desired, select slips from tall-growing varieties and increase the size of the pot from year to year. Some kinds may be made to grow five or six feet high.

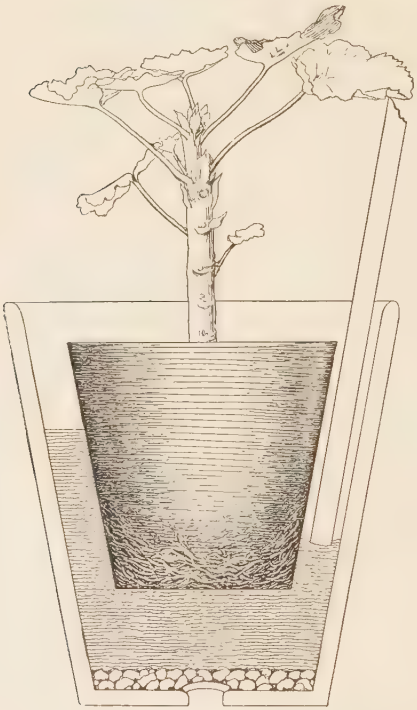


FIG. 19. Section of a Flowerpot, showing how a Geranium is potted

The potting stick is used in packing the earth about the plant

Water the plant two or three hours before it is to be shifted. Place drainage material and enough soil in the pot to raise the ball of earth to within half an inch of the top. Invert the pot containing the geranium, holding the plant, with its ball of soil and roots, in one hand. Strike the edge of the pot against a table, remove the plant, and pick out the drainage material if it adheres to the roots. Without breaking the ball, set the plant in the larger pot and fill soil around it

firmly; water it thoroughly and place it in the window. If the ball of roots has been seriously disturbed, it will be best to let the geranium stand in the shade for several days. Keep it moderately moist until growth begins again.

Plants started from slips cut in August are excellent for winter blooming. The best results for spring and summer will be obtained with plants started from winter slips.

Geraniums may be taken up from beds in the fall, before they are injured by frosts, and stored in a cellar where the temperature will not go below freezing. They should be given a moderate amount of water. The plants may be used for making slips during the winter, or they may be cut back and planted in beds the next spring, when all danger from frosts is over.

CHAPTER IV

WINDOW BOXES

Boxes that can be placed on the inside window sill during the winter and moved to the projecting ledge outside in the summer are convenient for teaching pupils how to use and appreciate the value of window boxes, as well as porch boxes, which are becoming very popular in many cities, where they frequently provide the only opportunity for cultivating house plants in the open air.

The box should be made from wood and should be seven inches deep and eight or ten inches wide. The length may be made to fit the width of the window. Six or eight inch holes should be bored in the bottom of the box for drainage.

A zinc tray one inch deep and an inch wider and longer than the box must be made, to receive the drainage. This should be used outside as well as in the room, for drainage from plants will leave streaks on the wall if permitted to run down on the outside. The box should be raised a fourth of an inch from the bottom of the tray to allow space for water below.

A compost consisting of one third garden soil or fibrous loam, one third well-rotted barnyard manure, and one third sand, sifted through a quarter-inch screen,

will make a good soil for the box. Put a piece of broken pottery or flowerpot with the hollow side down over each of the holes; then place a layer of half an inch of pebbles or crushed stone over the entire bottom

Fig. 20. An Outdoor Window Box

of the box. On the drainage layer place an inch of the coarse material that would not go through the screen. Have enough soil in the box to reach to within half an inch of the top after settling. Water thoroughly and add more soil if it settles too much. Let it stand for two or three days before planting. When the soil

becomes mellow so that it falls apart when a handful is pressed together lightly, it is in the right condition.

During the early part of the winter the box may be used for propagating plants by means of cuttings. In March the cuttings may be transferred to pots so that the box may be used for growing plants from seeds. After the seedlings are ready to transplant, the box may be set outside on the window ledge.

For home use it is sometimes desirable to keep window boxes exclusively for decoration, without giving any attention to plant culture. For this purpose put a layer of pebbles in the bottom of the box, arrange the pots in the box, and fill in with clean pebbles and sand. The pots can then be lifted out easily when others are to take their place.

Plants that are in pots or boxes out of doors must be watered each evening. All of the soil should be saturated; moistening the topsoil is not sufficient to keep them in good condition. The leaves should be sprinkled often to remove dust, but the flowers should be kept dry.

CHAPTER V

HANGING BASKETS AND PORCH BOXES

The compost for the hanging basket must be made so that it will retain moisture. This may be done by mixing about equal parts of leaf mold and garden loam. Place moss or some coarse material in the bottom of the basket. If it is to be used out of doors, hang in a light place, but do not expose it to the direct rays of the sun except during a few hours in the morning or late in the afternoon; keep it in a protected place where it will not be exposed to drying winds. Give indoor baskets the same attention given to ordinary potted plants.

FIG. 21. A Porch Box containing Petunias and California Poppies

The following plants are well adapted to either porch boxes or baskets: plants of drooping habit — variegated periwinkle, English ivy, maurandia, *Asparagus sprengeri*, German ivy, trailing fuchsia, wandering Jew, and oxalis; erect-growing plants — sweet alyssum, petunias, begonias, pansies, and many different varieties of geranium.

CHAPTER VI

SELECTION AND CARE OF DECORATIVE PLANTS

Plant Names

Plants may be designated either by their common names or by scientific names. The scientific name is made up of two words: the first that of its genus and the second that of its species. The name of the genus unites into groups the plants that are closely related, while the name of the species distinguishes the particular plant in the group. The early spring flower known as bluebell has for its scientific name *Mertensia virginica*, of which *Mertensia* answers very nearly to the surname of a person, as *Jones* or *Smith*, and *virginica* to the baptismal name, as *John* or *James*. Sometimes an adjective that describes the variety is added, as in *Rosa rugosa alba* and *Rosa rugosa rubra*, the former being a white variety and the latter a red of the same species.

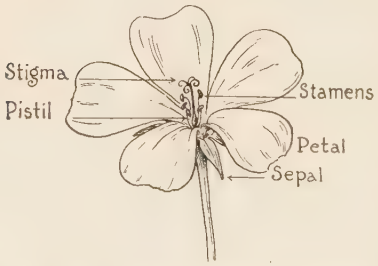


Fig. 22. A Single Geranium Flower

Fig. 23. A Double Geranium Flower

To avoid errors in ordering plants from dealers, the scientific name should be used if the plant is so designated in the lists.

In descriptions of plants the names of parts of flowers are frequently given. The single geranium is a good plant to use as a type. The flower is formed by alternating whorls, or cycles, of modified leaves. The outer whorl is the *calyx*. Each of the five separate parts of the calyx is known as a *sepal*. Inside the calyx is the *corolla*, consisting of five parts, each of which is known as a *petal*. The corolla incloses the *stamens*, the fertilizing organs of the flower. In the center of the flower is the seed-bearing organ, or *pistil*. In some geraniums there are several whorls of the corolla, and such flowers are known as double flowers.

The Aspidistra

The aspidistra is the hardiest of all plants for house decoration and is well adapted to north windows or to corners where there is little or no direct sunlight. The leaves are strap-shaped or lanceolate, and the color is deep green or variegated. The arching habit of the leaves makes the plant attractive when placed on a small stand. After it has become of suitable size, it may be kept in a corner of a room in a six-inch pot for three or four years without being repotted. During July and August it should be kept on a porch or under a shade tree where it will have direct sunlight during a part of the day.

In order to keep the plant in good growing condition it should be repotted each year. As the plant grows the

Fig. 24. An Aspidistra

size of the pot may be increased. If it is desired to keep the plant small, it should not be repotted so often.

In repotting an aspidistra use one third fibrous loam or garden soil, one third well-decayed manure, and one

third sand. The plant must have plenty of moisture, but the water must not stand in the saucer. The leaves should be kept free from dust by washing them with a garden sprinkler at intervals. Occasionally remove some of the topsoil, fill in half an inch of powdered sheep or cow manure, and then cover the manure with a layer of loose soil. This will keep the plant in a thrifty condition.

Aspidistras are propagated by means of cuttings taken from the roots.

Ferns

The Boston fern is a graceful, rapid-growing, and healthy house plant. It thrives in any room, but is most successful in places where it does not receive much strong sunlight. During the summer it should be kept on a stand out of doors in the shade, where it will have a free circulation of air from all sides.

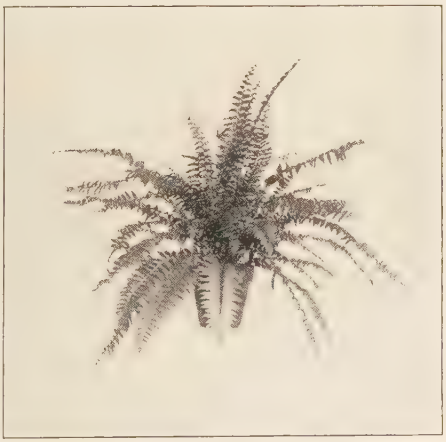


Fig. 25. A Boston Fern

A fern will make its best growth during the summer if repotted immediately after it is taken out of the house. It should have a liberal supply of moisture, but the pot

must be well drained, so that the water will run away from the roots easily. There should be a space of at least an inch above the soil in the pot so that it may be given an occasional dressing of well-decayed leaf mold. This will supply the plant with some nourishment and help hold the moisture. Ordinarily the leaves need not be watered, but they must be washed when they become dusty.

In repotting the plant use well-rotted manure, leaf mold, soil, and sand, one part of each. The soil must be well mixed but should not be too fine.

Ferns are reproduced by means of spores that grow on the underside of the leaves, but this cannot be done successfully in the house without the help of a glass case to retain the moisture. New plants which come up from the roots may be obtained from a thrifty fern in a large pot.

Palms

Kentia belmoreana, one of the erect-growing, feather-leaved palms, is the most beautiful and successful plant for halls and other places in school buildings where light is not abundant. The foliage is dark green and the leaves are wide and gracefully recurved. It does not need any direct sunlight and will stand a temperature nearly as low as freezing or the usual living-room temperature.

For a low-growing variety the fan palm (*Livistona sinensis*) is the most popular. It is of a compact and

robust habit, and grows rapidly, but the leaves are more easily injured than those of the feather-leaved varieties. Palms make very little growth while they are in the house. They do not need so much water during the winter, but the soil must be kept moist. During the summer they should be kept out of doors in the shade, and they must have an abundant supply of water so that they will form new leaves.

Palms should be put into comparatively small pots, which may be increased in size as the plants grow, although they may be kept in good condition in the same pots for several years. In repotting use equal parts of fibrous loam and garden soil. Do not tear the roots apart or place much soil above them. If the plants are not to be repotted for several years, they should be given a rich top-dressing of cow or sheep manure or bone meal and dried blood each year, when they are placed out of doors. One inch of manure or a pint of equal parts of bone meal and dried blood is sufficient for a large plant. Place a layer of soil over the dressing.

Large plants in halls should be kept in oak or cedar tubs with handles, so that they may be carried to a convenient place where the leaves can be washed with a sprinkler. In order to keep the floor in good condition, an indurated-fiber flowerpot saucer or a zinc pan should be kept under the tub to catch the drainage.

Fig. 26. A Begonia and a Rubber Plant in a Dining Room

The Rubber Plant

On account of its fleshy, dark-green leaves the rubber plant (*Ficus elastica*) is excellent for a corner in any room. It does not need much sunlight while in the house. During the summer it will grow rapidly out of doors in partial shade. To keep the plant in growing condition

repot it annually. Use soil consisting of equal parts of well-decayed barnyard manure, garden soil, and sand. If it is desired to limit the size of the plant, it should not be repotted so often; it should be given plenty of moisture and an occasional top-dressing of manure. The leaves must be washed or sprayed frequently.

New plants may be rooted from the tops or branches of old ones in the following manner: Select a good branch with several leaves and remove a ring of bark just below the lowest leaf. Split a small flowerpot lengthwise and place it round the branch. Tie the parts of the pot together and fill it with sphagnum moss or fibrous soil. Keep the soil moist until the branch is thoroughly rooted, when the top with the roots may be removed and potted.

Begonias

Begonia rubra is very easily grown, either in school or at home. A strong plant kept in partial sunlight will bloom continuously for several years in succession. Keep the soil moist and the leaves free from dust, but do not spray the plant more than is necessary to keep it clean. It will do well in a low temperature but must be kept away from drafts.

The soil for *Begonia rubra* should be porous. A good compost is made of equal parts of fibrous loam, leaf mold, and sand well crushed and mixed but not sifted. A little charcoal added to the soil will help make it porous and will benefit the plant.

As the begonia grows it should be repotted and the size of the pot increased. When repotting, disturb the ball of earth as little as possible. The soil should contain no manure, nor should liquid manure or other strong fertilizers be added. If the plant needs fertilization, remove some of the topsoil and replace it with a mixture of equal parts of leaf mold and garden soil. Provide plenty of moisture and give it strong sunlight sparingly.

Use the same method for propagating *Begonia rubra* as for geraniums. Remove most of the foliage by cutting away entire leaves or parts of large ones. The small leaves on the ends of slips should not be removed.

Begonia rex is more difficult to grow than the other varieties of begonia, but there is no plant which has more beautifully shaded foliage. It is one of the most popular decorative plants for north windows. The leaves should be protected while the room is being swept, so that they will not need washing. In schoolrooms the plant may be kept in its best condition if placed under a bell jar overnight. If too much moisture collects under the bell jar, it should be raised slightly for ventilation.

Begonia rex is reproduced by means of leaf cuttings. Cut off the leaf stalk near the blade. Prepare the soil and sand in a pot as for geranium cuttings. Cover the base of the leaf with sand to a depth of half an inch. Keep the sand moist but do not allow drops of water to remain on the blade of the leaf. The cutting will do best if kept in a warm room under a glass cover.

Tuberous begonias have large, bright-colored flowers during the summer and fall months. They are excellent plants for window or porch boxes or for bedding in either school or home yards. In school yards they

Fig. 27. *Begonia Rex*

may be planted in tulip beds after the tulips have been taken up. The plants are reproduced by means of corms.

The corms may be started in any kind of soil that is porous. Place them in three-inch pots, barely covering the crown. Keep in a warm place and give them a scant supply of water until they begin to grow; then water liberally. Plants started the first of May will be

ready to be shifted to five-inch pots, window boxes, or beds by the middle of June. They will bloom well if planted in the soil used for window boxes. Give them some shade from the hot sun. Let them dry gradually in the fall and keep them in soil in a dry place over winter.

The Cyclamen

The cyclamen is one of the most beautiful flowering plants for either schoolroom or home windows. Many colors may be obtained. It may be reproduced by means of seeds or bulblike, fleshy stems known as corms. On account of the length of time required to reproduce the plant from seed, it is advisable to purchase corms or plants that are in bloom.

Plant one corm in a four-inch pot. The soil should consist of equal parts of fibrous loam, leaf mold, and sand. The corm must be firmly placed in the soil near the surface. As the buds begin to swell, place the plant near the windowpane and give it an abundance of water. Cyclamens stand extremes of temperature but will bloom best if not kept in an excessively warm place. The plant may be grown a second year. After blooming, remove it with the ball of earth from the pot and plant in a shady corner, giving it no further attention until fall. It will not suffer injury if the leaves die down entirely. Before active growth begins, repot the plant, water it sparingly for a few days, and then give it an abundance of water.

The Fuchsia

The fuchsia is best adapted to summer and fall blooming, although there are some good winter-blooming varieties. When the plant is three or four inches high, it may be placed in a four-inch pot. One potted in March

Fig. 28. Fuchsia

should bloom in August. The soil should consist of equal parts of rotted manure, loam, and sand. Sift the soil and put an inch of the coarse material, mostly manure, in the drainage layer in the pot. Place the plant in the fine soil so that the roots will be an inch below the surface. Leave a space of half an inch for water. At least once a month, after the plant is well started,

give it a top-dressing of cow or sheep manure, or work a tablespoonful of fine bone meal into the soil two or three times during the summer.

Keep the plant in a partly shaded place out of doors after danger from frost is over, and shower the foliage often. When hard wood begins to form, the yellow lower leaves should be picked. Make the plant symmetrical by cutting out the end, or terminal, bud if it grows too slender. If the plant is thrifty, two branches will appear where the terminal bud has been removed.

Fig. 29. Fuchsia Cutting

Plants intended for summer and fall blooming should have their water supply gradually reduced after blooming. When the wood is well hardened, place them in a cellar for two or three months to winter unwatered. If they are placed in a basement containing a furnace, they must be given some water. Bring them up to the light in February or March, and as leaves begin to grow, remove the plants from the pot, pick out all old earth, and repot with fresh soil. The top may be cut back if desired. Water moderately at first, but after growth begins, give the plant a liberal supply of water.

Winter-blooming varieties should be given a scant supply of water during the summer. In the fall give them an abundance of both food and water.

Fuchsias are propagated by cuttings. Branches for cuttings may be encouraged to form by removing end buds freely during the summer. This will cause a bushy

growth. Instead of letting the plants die in a cellar, continue to give them a limited amount of water during the fall. In December give them plenty of dressing and moisture and then keep them in a warm room, to promote growth.

A slip three inches in length will make a good cutting. Cut back at least half of the leaves.

Fig. 30. An Abutilon

The Abutilon

The abutilon, or flowering maple, which bears large, bell-shaped flowers of various colors, will succeed under the same general treatment as the fuchsia. It may be used either as a winter or as a summer plant, and may be grown successfully in any window that does not have much sunlight.

The plant is propagated by means of cuttings, which may be taken at any time of the year.

The Coleus

On account of its beautifully colored foliage the coleus is valuable as either a decorative or a bedding plant. It will thrive in any schoolroom or home window. Since it cannot stand an excessively low temperature, it should be moved away from the window on cold nights; it must not be subjected to drafts. The foliage should be frequently washed with a sprinkler to remove dust, but the plant must not be set out in cold rains when it is accustomed to being indoors. The plants may be propagated by stem cuttings at any time of the year. Those started in September may be used for potting during the winter. Plants for bedding should be started in December or January. Small ones may be placed in pots with other plants, with excellent effect if the colors are selected carefully.

In preparing the slips, cut back the leaves liberally. Soft end slips must be avoided. A slip three inches in length, with the upper cut near a bud, will prove most successful. Prepare the soil as for geraniums and plant the slips one inch apart and one and one-half inches deep. The soil must be kept moist. Protect them from the sun for eight or ten days, when they may be given a sunny place. If the plants are to be propagated at home, they will thrive best in a sunny kitchen window; the air in that room contains more moisture than that of other rooms.

The Azalea

The azalea is difficult to propagate in the house but is a very desirable plant to purchase from dealers, on account of the numerous rich-colored flowers that it produces. Azaleas taken from the greenhouse in December should bloom during the greater part of the winter.

It is best to water the plant with soft water. Lime will injure it so easily that even the small quantity contained in hard water will hinder its proper development. It should be watered freely, so that the water will penetrate the thick mat of fine roots, and should be kept clean by showering freely when not in bloom.

For repotting, use two thirds fibrous loam and one third sand. The plant should be repotted late in winter, but need not be repotted often. During the summer keep it out of doors in a cool, shady place, but give it an abundance of water.

The Oxalis

The oxalis may be produced easily in either the schoolroom or the home window. The bulbs may be planted in either spring or fall. A dozen may be planted in a six-inch pan that is three inches deep. The pan may be suspended from a bracket fastened to the window casing. The bulbs must be watered sparingly at first, but after they begin to grow, plenty of water must be given them. When they are done blooming, let the soil dry out gradually and repot them after they are entirely dry.

CHAPTER VII

PLANTING BULBS IN THE YARD

Preparing the soil for bulbs. The necessary tools for preparing the soil are a spade, a rake, a yardstick, a garden line, and a dibble about four feet long and two inches in diameter. Stakes should be placed a foot or more from the edges of the beds, to avoid loosening them while digging. With a sharp spade cut the soil along the edges of the bed, so that the sides will not appear irregular when finished. The bed should then be spaded to a depth of at least eight inches. While spading, work in well-rotted barnyard manure; a wheelbarrow load for a bed four by eleven feet is sufficient. The first soil taken out must be put in a heap on the lawn or loaded onto a wheelbarrow, so that it may be used to fill the trench at the other end of the bed after it has been spaded. The soil should be turned while it is being spaded so that the topsoil will be at the bottom of the bed. Break large clods with the spade while working. After the bed has been spaded, break all small lumps and level it with a garden rake.

FIG. 31. A Dibble for making Holes for Bulbs

The beds should be prepared during the early part of September. This will give ample time for the fall rains

to settle the soil. The time for planting bulbs depends on the climate and the season. It is usually best to wait until some time in October or early in November, when the temperature begins to fall below the freezing point during the night.

Tulips

Varieties. If there is room for more than one bed, varieties may be selected to give a succession of blooms in the different beds. The May-blooming tulip, because

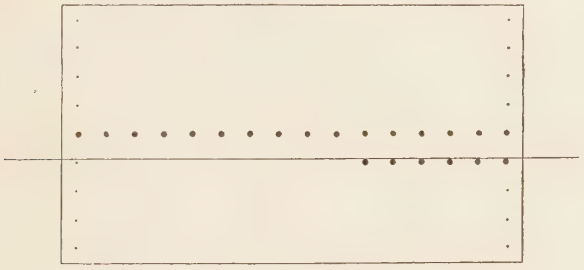


Fig. 32. Diagram showing how to plant Bulbs

of its large, rich-colored flowers on a long stalk, is well adapted to planting in long rows. Four rows six inches apart make a pretty bed.

Planting the bulbs. Rake the soil to a depth of about two inches, so that all crusts and clods will be broken. Measure off rows six inches apart at each end of the bed. The outside rows should be close to the edge, so that the entire bed will be covered with plants when they come up in the spring. Drive a stake for stretching a line a foot or more beyond each end of the bed. First make holes for the middle row. They should be six

inches apart and of sufficient depth to have the tops of the bulbs five inches below the surface of the soil when set (see Fig. 32).

Place the bulbs right end up and, after they have all been set in the bed, fill the holes with a rake and make the bed level. When the ground is frozen hard, cover the whole bed with barnyard manure to a depth of two inches or more. If this is not done, there is danger of the ground thawing when warm days come during the winter. Alternate freezing and thawing will cause the roots that form in the fall to break away from the bulb. The manure, excepting some of the fine material, must be removed in the spring as soon as danger of freezing the bulbs is past.

Fig. 33. A Tulip Border

Daisies or pansies in the tulip bed. After the tulips come up in the spring, daisy or pansy plants that have been grown in a cold frame may be planted between them. If carefully selected, they will bloom with the tulips and help fill the bed with leaves and blossoms.

Crocuses

Crocuses should be planted in September or October. They may be brought to their highest degree of perfection when grown in well-prepared beds and planted to a depth of three inches, two inches apart. A circular bed two or three feet in diameter makes a pretty appearance. In such a bed the rows should be circular, so that different colors may be used in the different rows with good effect. Crocuses are also attractive in border beds that contain perennials. School yards that have no beds for plants can be made very interesting by planting crocuses at random in the lawn, in clumps of a dozen or more. Planted on the sunny side of the building, they will make their appearance soon after the spring snows disappear. Some of the winter-blooming varieties may be expected to bloom whenever the ground thaws.

Fig. 34. Crocuses in the Lawn

The only tool needed is a dibble. The holes should be three inches deep and scattered irregularly. Some may

be placed where the lawn is somewhat shady; this will insure a succession of blooms. Care must be taken to place the bulbs right side up. Fill the holes with soil consisting of at least one third well-rotted manure.

Fig. 35. Planting Crocuses, Snowdrops, and Scillas in the Lawn, State Normal School, Framingham, Massachusetts

This manure must contain no coarse material; it must be thoroughly mixed with the soil. Care should be taken to put enough soil into each of the holes so that no depression remains after it settles. The extra fertilization given to the earth surrounding the bulb will also stimulate the growth of grass.

Hyacinths

The single varieties of hyacinths are best for bedding. As with tulips, care must be taken to select varieties that are of nearly uniform height and that bloom at the same time. The colors must have shades that will admit of artistic grouping. Tulip bulbs hold first rank for school-yard planting, on account of their brilliant colors and moderate cost, but if the same beds are in use from year to year, hyacinths will give an agreeable change. Pupils should become familiar with their culture, although this may be accomplished with beds smaller than those intended for the principal ornamental beds. A small circular space that will contain two dozen bulbs will serve the purpose as well as a larger one.

Spade up the soil to a depth of twelve inches and work in two inches of well-rotted manure, which must be well mixed with the soil, so that lumps of coarse material will not come in contact with the plants. Plant the bulbs seven inches apart, with the tops six inches below the surface of the soil.

Hyacinths may be planted from the latter part of September until winter sets in. If there should be a time when the ground is not frozen, they may be planted during the winter, provided the bulbs are in good condition. Those planted in the fall will form roots immediately and make an earlier growth, while the bulbs put in during the winter will make roots in the spring and bloom later than the fall-planted ones.

After the ground is frozen, cover the bed with a thick coating of coarse manure, straw, or leaves, which must be removed in the spring when all danger of freezing the bulbs is past. Occasional crusts that may be formed on the surface during cold nights in the spring will do no harm.

Narcissi

The daffodil, the jonquil, and the poet's narcissus should be planted in clumps of a dozen or more in convenient,

Fig. 36. Trumpet Narcissi

sunny places, preferably in the front of a border that contains hardy, herbaceous plants or shrubbery. They may be left in the ground from year to year, but should

be lifted every three or four years, so that the clumps of bulbs that form may be separated and replanted.

In preparing the soil, spade it to a depth of at least twelve inches. Work in two inches of well-rotted barnyard manure. Plant the daffodil and poet's narcissus bulbs so that they will be twelve inches apart, with the tops five inches below the surface of the soil. Jonquils should be six inches apart, with the tops four inches below the surface.

The bulbs are perfectly hardy, so that no protection is needed, but they will make an earlier and stronger growth if they are given a thick coating of coarse manure just before winter begins. In the spring the fine part of the dressing may be left on the bed. The extra nourishment will help in making larger flowers, and stronger bulbs for the next season's growth. After the leaves die down in July or August, the ground may be loosened above the bulbs with a hoe or spade.

Narcissi are the most inexpensive of the hardy bulbs. A single bulb will form a large clump in a few years. The varieties should not be mixed. A very pleasing effect is secured by planting a number of kinds, each in a separate place.

Snowdrops and Scillas

Snowdrops are the earliest of the spring-flowering bulbs. They may be seen peeping through the ground even while it is covered with snow. They are closely followed by the blue *Scilla sibirica.*

Plant the bulbs in the lawn the same as crocuses, or in small beds in protected places. A circular space eight inches in diameter is large enough for a dozen bulbs. Take out the soil to a depth of six inches. If it is poor, mix it with sand and fine manure, so that it will

FIG. 37. *Scilla Sibirica* in the Lawn

The illustration shows flowers in bloom on March 15, in Cambridge, Massachusetts

consist of one half soil, one fourth sand, and one fourth manure. Put the prepared soil into the hole so that it will reach to within three inches of the top after it is well packed; then plant the bulbs and fill in the soil gradually. Push it down carefully with the ends of the fingers, so that the bulbs will be set in the ground firmly, with the tops up. Cover them with enough earth so that no depression will remain to collect water after the soil is settled.

September or October is the proper season for planting. This will give the bulbs an opportunity to make a strong growth of roots before cold weather. They may be left undisturbed for years. The dressing usually given lawns is sufficient to stimulate their growth.

Taking up Bulbs

Tulips and hyacinths should be taken up after the leaves die, so that they may be sorted and replanted in the fall. They will come up for several years in succession if left undisturbed, but a more even growth is assured if new bulbs are used and if the beds are made over each year. The old ones may be planted in irregular clumps in borders, where they should remain.

The leaves of the bulbs should die down naturally before they are taken up, or, if the beds are wanted immediately for other plants, the bulbs may be taken up as soon as the leaves turn yellow, and may be "heeled in" (planted close together in some out-of-the-way corner) until they have ripened naturally, after which they may be placed in a cellar or some dry, cool place until wanted in the fall.

The late tulips and the crocuses, narcissi, snowdrops, and scillas should be left in the ground undisturbed.

The bulbs in borders are all planted so deep that the ground can be cultivated above them after the leaves die down. The smaller varieties of annuals may be planted above them.

CHAPTER VIII

PLAN OF THE YARD

Plants intended for adornment should generally be arranged irregularly and in subordinate positions, in the school yard as well as in the home lawn. Single plants may be used for the purpose of breaking up the monotony of the surface of the lawn; groups may be placed on the border near walks and drives and about the building.

In a school yard a plot for studying the method of planting and cultivating flowering plants may run parallel with the front walk, where it will also serve to decorate the yard. There should be a strip of grass between it and the walk. After the bulbs are done blooming, the same space may be used for summer-blooming plants or for crimson clover, buckwheat, or some other green crop that will fertilize the soil and keep the plot looking well during the summer without requiring any further attention before school opens in the fall.

Perennial flowering plants may be planted in a plot that runs parallel with a drive leading to the rear of the building. This should be separated from the drive by a strip of lawn. The dimensions of the plot will depend to some extent upon the size of the yard.

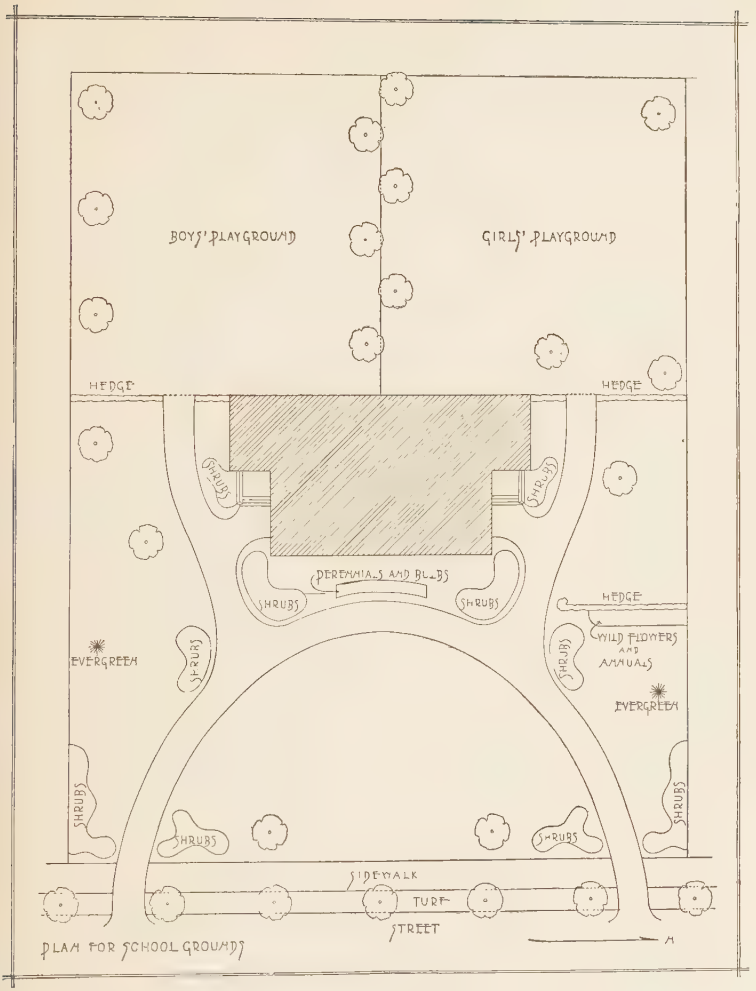


FIG. 38. Suggestion for planting School Grounds

A planting list may be made from plants described in the text

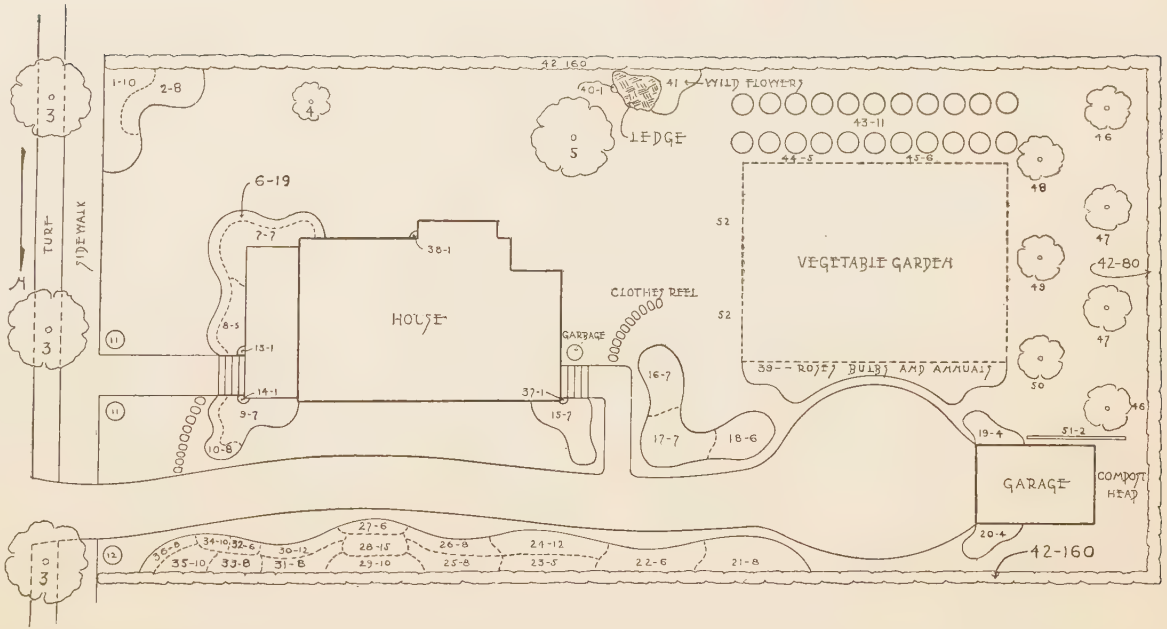


FIG. 39. Suggestion for planting a Yard 80 ft. × 160 ft.

The figures in the illustration indicate the plants given in the Planting List below. When a figure is followed by a dash and another figure, the second figure indicates the number of plants to be used

1-10. Slender deutzia, *Deutzia gracilis*
2-8. Large-flowered hydrangea, *Hydrangea paniculata grandiflora*
3-3. Sugar, or rock, maple, *Acer saccharum*
4-1. Japanese magnolia, *Magnolia soulangeana*
5-1. Wier's cut-leafed silver maple, *Acer dasycarpum* var. *wierii*
6-19. Japanese barberry, *Berberis thunbergii*
7-7. Japanese rose, *Rosa rugosa*
8-5. Fortune's golden bell, *Forsythia fortunei*
9-7. Fortune's golden bell, *Forsythia fortuneii*
10-8. Japanese barberry, *Berberis thunbergii*
11-2. Double pink almond, *Prunus japonica* var. *rosea flore-plena*
12-1. Double white almond, *Prunus japonica* var. *alba flore-plena*
13-1. Hall's honeysuckle, *Lonicera japonica* var. *halliana*
14-1. Trumpet vine, *Tecoma radicans*
15-7. Mock orange, *Philadelphus coronarius*
16-7. Japanese snowball, *Viburnum plicatum*
17-7. Flowering currant, *Ribes aureum*
18-6. Japanese quince, *Pyrus japonica*
19-4. Common purple lilac, *Syringa vulgaris*
20-4. Common white lilac, *Syringa vulgaris alba*
21-8. Rose of Sharon, in variety of colors, *Hibiscus syriacus*
22-6. Carolina allspice, *Calycanthus floridus*
23-5. Mountain laurel, *Kalmia latifolia*
24-12. Azalea, in variety of colors, *Azalea mollis*
25-8. Feverfew, *Pyrethrum uliginosum*
26-8. Wild rose, *Rosa lucida*
27-6. Peony, in variety, *Pæonia*
28-15. Phlox, tall in variety, *Phlox decussata*
29-10. Golden glow, *Rudbeckia laciniata flore-plena*
30-12. Foxglove, *Digitalis purpurea*
31-8. Hollyhock, in variety of colors, *Althæa rosea*
32-6. Bleeding heart, *Dicentra spectabilis*
33-8. Canterbury bell, *Campanula medium*
34-10. English daisy, variety of colors, *Bellis perennis*
35-10. Larkspur, in variety, *Delphinium* hybrids
36-8. German iris, in variety, *Iris germanica*
37-1. Crimson rambler, *Rosa*
38-1. Boston, or Japanese, ivy, *Ampelopsis veitchii*
39. Roses, bulbs, and annuals
40-1. Woodbine, or Virginia creeper, *Ampelopsis quinquefolia*
41. Wild flowers
42-400. California privet hedge, *Ligustrum ovalifolium*
43-11. Currants
44-5. Gooseberries
45-6. Raspberries
46-2. Apples, 1 early and 1 late
47-2. Pears, 1 early and 1 late
48-1. Cherry
49-1. Peach
50-1. Plum
51-2. Grapes
52. Row of cannas and dahlias to screen vegetable garden

FIG. 40. A Well-Arranged Lawn

The building shown is the Latin School in Cambridge, Massachusetts

A bed for wild flowers may be made in some convenient corner, or may form a prominent feature of the perennial border. The plot should be of some form that is suited to the plan of the lawn. Circular beds or beds irregular in form are sometimes useful for the purpose of breaking up the regularity of the general plan.

FIG. 41. A Bed of Geraniums.
Tulips or hyacinths may be planted in the bed in October

Front fences may not be needed, but corners should be protected by shrubs extending along the walk on each side, the distance depending upon the size of the lawn. The Japanese barberry is excellent for this purpose. *Rosa rugosa* may be planted in the angle formed by the barberry bushes.

The lawn may be separated from the adjacent property by annual or perennial flowering plants of the taller

kind or by hedges of privet, lilac, barberry, Japanese quince, or some other plant that grows well in the locality.

If the front yard is large, it may be well to plant a tree near the center or in some convenient place where it will be in harmony with the general landscape. For this purpose the Ginkgo, or maidenhair tree, the Norway maple, Japanese maple, horse-chestnut, and the purple and copper beech are very satisfactory.

For ornamenting the lawn itself, selection may be made from the numerous varieties of spirea, lilac, hibiscus, magnolia, hydrangea, and other shrubs adapted to the climate. They may be used either singly or in clumps. Although it must be borne in mind that grass is the most prominent feature of the lawn, trees and shrubbery are placed there for the purpose of giving an artistic effect to the whole.

If it is necessary to have a back-yard fence, palings should be used, for they are well adapted to support Virginia creepers or other climbing plants.

Buildings constructed of brick or stone may have their appearance improved by hardy climbing vines. The Boston ivy is excellent for this purpose.

Large trees should be planted to protect the south and west windows from the hot sun, as well as to provide shade for the back yard. Arrange trees there irregularly and on the border as far as possible. If there is to be a garden or an orchard, large trees must be kept out of the way and fruit trees planted instead of the regular shade trees.

CHAPTER IX

THE LAWN

Grading. In order that the lawn may be well drained, it should have a gentle slope toward the street. If it is necessary to remove elevations, the topsoil should first be taken off in such a manner that it can be replaced. A good lawn needs at least five inches of loam; for a good growth of shrubbery there must be twelve inches. In case the topsoil has been disturbed in making excavations for constructing the building, new soil must be provided. Three inches of clayey loam should be added if the soil is mostly sand.

A lawn that is elevated eight or ten inches above the walk and held in place by a cement curbing usually has a neat appearance, especially if the front yard is small. Terraces in which the soil is held in place with turf are attractive for home yards, but they should, as a rule, be avoided in school yards.

Manure. After the yard has been given a uniform slope, spread over it a layer of from one to two inches of well-rotted barnyard manure from which all coarse material has been removed, so that the entire yard will get a uniform coating of the good material. Manure taken from cow barns is best. Fresh manure should not be used; it may contain weed seeds that will be

FIG. 42. An Ideal Lawn

The house faces the east

troublesome in the lawn. Manure that is taken from henhouses is so strong that it must be used sparingly.

Preparing the soil. Spade the yard to a depth of six inches. While spading, the manure must be worked into the soil uniformly. Large clods must be broken with

FIG. 43. Buckwheat Seed

the spade. If the soil is prepared in April or May, it may be seeded immediately, but it is usually advisable to use the land for the production of a crop that will give an abundance of vegetation and at the same time provide the soil with a supply of nitrogen to serve as food for the young grass. In latitudes south of Washington, D.C., cowpeas and soy beans may be used; in districts north of this, crimson clover, vetches, Canada

peas, and buckwheat are suitable. These crops should remain on the land until August, when the whole yard should be spaded again. Some vegetation may be removed if the growth is very prolific, but a considerable quantity of it should be spaded in; it will make the soil more retentive of moisture and better able to hold the fertilizers applied to it. After spading, all low places caused by unequal settling must be filled in. Make the soil firm with a roller or with the back of a spade; the latter usually gives the best results.

Varieties of seed. It will be advisable to find out the varieties of seed best adapted to each particular locality. Mixed seed is better than any one kind. This will provide for the differences in light, soil, and moisture found in small areas. Mixtures for different purposes may be obtained from dealers. The seed should be used at the rate of one quart for each three hundred square feet. For spring sowing one eighth of this should be white clover. This is nearly double the quantity of seed ordinarily required for large areas. A smaller amount would cover the ground, but it is better to let the weak plants be eliminated as the stronger ones make their growth than to give weeds an opportunity to gain a foothold, as they will if some of the ground fails to be covered.

Sowing the seed. If the ground cannot be watered, the seed should be sown before a shower. A uniform distribution of seed may be obtained by sowing in two directions: half should be scattered in one direction across the land and the other half at right angles to the

first. This method will prevent streaks and thin places in the lawn, caused by unequal distribution. After scattering the seed, pass over the ground with a garden rake. Care must be taken to cover none of the seed to a depth of more than one inch. Where it is convenient to water the lawn it should be sprayed each evening, so that the soil will keep moist to a depth of five or six inches, until the grass is well started. A little spraying that merely moistens the top and dries out the next day in the hot sun is of no value. Later the lawn need not be watered so frequently. After the roots have acquired considerable length, the grass will make a stronger growth if the topsoil is somewhat dry, so that the roots will be obliged to reach down for moisture.

FIG. 44. Lawn Decoration in the Boston Public Garden

Sodding. For sloping banks it is often necessary to use sod, as the rain will wash away grass grown from seed before the roots have time to gain a foothold. In sodding steep banks, wooden pins may be used to hold the sod

in place. For quick results small yards are frequently sodded entirely, but this plan is not so successful as seeding; sodded yards are likely to be uneven, and it is difficult to find turf suited to the conditions found in most yards.

FIG. 45. A Century Plant

The tub containing the plant is set in the lawn. Foliage plants are growing in the mound of good soil that covers the top of the tub

Mowing. The lawn should be mowed regularly the first summer, care being taken not to clip it too frequently during the dry season. The general rule of keeping a lawn mowed to a height of two inches is a

safe one to follow. There is nothing more trying for grass than to let it go to seed, but if the lawn is clipped closer than two inches, the plants will not have sufficient leaf area to carry on future growth successfully.

Destroying weeds. Annual weeds are usually kept down by mowing. Such plants as dandelion, dock, and plantain must be removed by cutting them out with a knife. The crowns of the weeds should be cut just below the surface, before the plants scatter seeds. This will remove the bud from which new growth would start.

Renovating lawns. Lawns that have patches of soil only partly covered, or lawns that have a thin stand of grass, should be raked over with a sharp iron garden rake in the spring or fall, when the soil is saturated with moisture. All uneven places should be filled with good rich soil; then the required amount of seed should be sown and raked in. The yard may then be given its usual care.

Top-dressing. Well-established lawns will be improved if given a mulch of well-rotted stable manure in November or December. If the soil is good, a coating every other year is sufficient. It should contain much fine material, which will be carried beneath the surface of the grass by the rains and snows of the winter. All rough material must be raked off in the spring, when the grass begins to grow.

Instead of the top-dressing of manure, fine bone meal may be used at the rate of about two pounds for one hundred square feet. The fertilizer will be improved if an equal part of finely sifted coal or wood ashes is mixed with the meal. Use a screen as fine as a flour sifter.

CHAPTER X

ANNUAL FLOWERING PLANTS

Annual flowering plants, or plants that must have seed sown every year, fill an important place in both the school and the home garden.

Where there is a scarcity of shrubs, the larger kinds of annuals, such as the castor bean, sunflower, cosmos, aster, zinnia, marigold, and salvia, may serve as substitutes, either in clumps or as single plants, until the places are occupied by shrubbery.

Broad-leaved, tall-growing plants, like the castor bean and sunflower, make efficient screens for fences, outbuildings, or other unattractive objects. Tall plants may be massed near the objects to be screened, with a gradation of lower-growing plants in the foreground.

The medium-sized annuals may be grown in clumps near buildings. The four-o'clock, aster, petunia, zinnia, marigold, and gaillardia are suitable for such spots. By placing the sweet William, verbena, pansy, and sweet alyssum in front of them, a beautiful border effect may be obtained.

Vines may be planted where they will climb on porch trellises or wire fences. The moonflower, morning-glory, cypress vine, and climbing nasturtium should be planted where they will receive careful culture. For covering

old fences, sheds, and neglected places in back yards, nothing is better than wild cucumber vine.

For cutting, annuals should be planted in special places in the vegetable garden or in flower gardens

FIG. 46. A Bed of Poppies

This bed is in the center of a flower garden on the estate of Edwin Ginn Winchester, Massachusetts

where they can be given the room needed for full development. To insure the best results, soil adapted to the particular plant, ample space, and careful cultivation are necessary. In the vegetable garden they may be planted either in beds or in long borders beside walks.

If there is to be a separate flower garden, it should be carefully planned before any planting is done. The

straight rows may give way to graceful curves or to angles. The small space may afford room for the low varieties, while the larger one is planted with the taller kinds. Provision must be made for a succession and for harmony in color. If the flower garden is to be a permanent feature of the place, walks should be arranged to conform to the contour of the land, or, if the garden is level, it may be given some geometrical design by the use of gravel walks and grass borders. The soil in the various plots may be modified by the addition of sand, leaf mold, or clay, and by the use of plant foods, in order to prepare the soil for the needs of special plants.

The Aster

The aster is one of the best annuals for cutting. For early flowers the seeds must be sown in boxes or cold frames. Sow in the open ground for late summer and autumn flowering.

Sowing in boxes. Prepare a compost by mixing leaf mold, soil, and sand. The mixture should be fairly firm but in good condition for drainage. If leaf mold cannot be obtained, well-rotted manure will answer the purpose. Use one part of manure to one of soil and one of sand. Place considerable coarse material in the bottom of the box for drainage. Fill with the prepared soil to within half an inch of the top; press down lightly with a board; sow the seeds and sift over them a layer of soil about twice their own thickness. Water through a cloth and cover the

box with a pane of glass. When the seeds come up, remove the cover and place the box very near a window. Any schoolroom or home window where there is an abundance of sunlight will answer the purpose. Give them plenty of air and do not let the temperature go above seventy degrees. Transplant to other boxes when the second leaf appears, setting them two inches apart each way.

Soil. Well-decayed manure may be mixed with the soil. A small quantity of wood ashes will serve as a tonic for the plants and keep disease and insects away from the roots. Make the bed six or eight inches deep, to give the roots room to reach down for food and moisture. The subsoil must be well drained.

Planting. After all danger from frost is over, set out the plants twelve inches apart each way. If the leaves are large, remove some of them. Shade the plants for two or three days.

Culture. Keep a dust mulch on the soil during the entire summer. A top-dressing of rotted stable manure will help keep the ground moist. An occasional application of liquid fertilizer or manure water will help the plant to produce large blossoms.

To produce large flowers with long stems, allow only five or six shoots to grow, and remove all side branches, leaving only the terminal flowers.

Window boxes. Asters are very decorative in window boxes or in pots. If the ball of earth on the roots is not disturbed, they may be lifted while in bud. Water liberally and keep them shaded for several days.

Balsams

Balsams are quick, sure growers, and seeds sown in the open ground in May soon produce handsome, bushy plants thickly massed with large, roselike flowers. The blossoms grow on the underside of the leaves and show to best advantage when grown on a terrace or at the edge of groups of other annuals. The plants grow to a height of about two feet.

Sowing. In March sow the seeds in boxes and transplant two or three times in order to make strong plants. Give them plenty of light and water. Stocky, symmetrical plants produce the best flowers.

When transplanting to the open, set the balsams from twelve to fifteen inches apart each way.

Candytuft

Candytuft is one of the best white flowers for edging beds, for massing, for rockeries, and for cutting.

The soil should be rich and the plants must have an abundance of water. They branch freely, and if some of them are removed, the size of the flowers will be increased.

Sow the seeds out of doors in April, where the plants are to bloom, and thin them when an inch high. Sow in July for fall flowering.

The Castor Bean

The castor-oil plant (*Ricinus*), commonly called the castor bean, grows very rapidly to a height of five or six feet. It is often used as a screen and often also as the

Fig. 47. A Screen for a Barnyard Fence

Castor beans near the fence, with caladium and other low-growing plants in the foreground

principal plant in groups where a rich, luxuriant growth is required. The variety of color in the foliage of different sorts of castor beans is valuable in giving contrast. When they are grown in combination with the canna, caladium, coleus, salvia, and aster, a pleasing effect may be obtained.

Planting. In March plant seeds in boxes and cover one inch deep. Keep the soil moist but not too wet. Place the boxes in a sunny window and keep at living-room temperature. As soon as the first true leaves have formed, transplant to flowerpots or other boxes. Set a single plant in a four-inch pot. Plants in boxes should be set four inches apart. When all danger from frost is over, transplant out of doors. Set the plants from one to two feet apart, according to the variety, or, when the ground is warm, plant the seeds in the open where they are to stand. Seeds planted as late as June will make good plants for August.

Culture. Keep the soil well cultivated and moist. A dressing of decayed stable manure will encourage the plants to make a strong growth.

Centaurea, or Bachelor's-Button

Centaurea is also known as bluebottle, ragged sailor, and *Kaiserblumen*. It is one of the most attractive and graceful of the old-fashioned flowers. If placed in water, the blossoms increase in size.

Sow seeds of the annual varieties when all danger from frost is over. Make the rows one foot apart and thin the plants to from four to six inches apart in the row. Sow seeds of the perennial varieties in boxes in March and transplant in May or June.

Cosmos

Cosmos is one of the leading fall flowers. It is a strong, tall-growing annual, with bright, dainty flowers, and is most effective when planted in masses which serve as a background for low-growing plants. It has a robust, branching habit and will grow from four to six feet high.

Sow the seeds in boxes in March. Transplant to the open when danger from frost is over. When grown on good soil, the seedlings should be set eighteen inches apart each way.

The Cypress Vine

The cypress vine is a fine plant for training on small trellises, poles, or strings. It is thickly covered with dark green, feathery leaves and is dotted with intensely bright, velvety flowers. The general appearance of the plant is light and airy.

Sowing. Sow the seeds in the open in rich soil when all danger from frost is over. Thin the plants to stand from four to six inches in the row. Keep the soil well cultivated.

The Four-o'Clock, or Mirabilis

The four-o'clock is so called because it opens its flowers only late in the afternoon and on cloudy days. It is often used as a low summer hedge or screen. The plant is quick growing, erect, and bushy. Some of the low varieties

may not grow over twelve inches high, but the ordinary ones attain a height of from two to three feet. The blooming period is during the late summer and autumn. In Southern states it is a perennial and develops roots sufficiently large to be taken up and stored for spring planting. In the northern part of the United States and in Canada it is a tender annual.

Sowing. Sow four-o'clock seeds in boxes three weeks before the soil will be in good condition for planting out of doors. Transplant the seedlings to other boxes when the second leaf appears. Set the plants two inches apart each way. When transplanting out of doors set them in well-prepared seed beds, one foot apart each way.

After all danger from frost is over, the seeds may be sown where the plants are to stand. Sow five or six seeds in a hill, the hills one foot apart each way. Thin to one plant in each hill.

The Gaillardia

The gaillardia is an annual that produces an abundance of large, showy flowers throughout the summer. It is well adapted to growing in clumps in mixed borders and is very satisfactory for cutting. The flowers have long stems and keep fresh for a long time when placed in water.

Sowing. For early flowers sow seeds in window boxes and transplant to the open when there is no further danger of frosts. Set the plants ten inches apart each way, or sow the seeds in the open when the soil is

warm and in good condition. Thin as the plants become crowded. Give this annual a fertile, well-drained soil, with an abundance of sun and air.

Porch boxes. Gaillardias may be grown in porch boxes, either by themselves or with petunias or poppies.

Gourds

Gourds are luxuriant climbing annuals, useful for covering arbors, fences, or slopes, and bearing fruit which is interesting in form and color.

Planting. Gourds will grow in any kind of soil. Spade the place selected to a depth of one foot. Thoroughly mix a shovelful of rotted manure with the soil. Put ten or twelve seeds in a hill and thin to three plants when the second leaf is formed. Let them stand about three inches apart after thinning.

The Morning-Glory

The morning-glory (*Convolvulus*, also called *Ipomœa*) grows rapidly and will cover a large space in a very short time. The shoots grow long and are well provided with foliage. For covering summerhouses and porches it will twine around wire or strings and may be trained in any direction. For small spaces there is nothing better than the old-fashioned morning-glory, with its variety of colors. The Japanese morning-glory is more robust and will attain a height of from thirty to fifty feet. The leaves are of different sizes and shapes, and the color

varies from plain green to silvery and yellow. The flowers are of many colors. Some are deep, rich, and velvety, while others are white, red, and blue of various tints.

Sowing. For early planting, sow seeds in window boxes two or three weeks before the soil is in good condition in the garden. Sow out of doors when danger from frost is over. The Japanese varieties are slightly more tender than the old kinds. Thin the plants to from four to six inches apart, according to the variety. Soak seeds of the Japanese varieties in warm water for several hours before sowing, or file a small aperture in the horny covering of each seed.

The Moonflower

The moonflower (*Ipomœa*) is similar to the morning-glory, but it makes a much more vigorous growth. The leaves are large, frequently measuring six inches across. The large white flowers open soon after sundown and close the next morning. The effect, particularly by moonlight, is very beautiful. With good soil and plenty of moisture the plant will make a growth of from fifty to seventy feet, according to the variety. It is especially desirable for large piazzas.

Sowing. Sow the seeds in boxes and transplant, or sow out of doors when the ground is warm. Thin to ten or twelve inches apart. Before sowing, soak the seeds for several hours in warm water or file a small aperture in the horny covering.

The Marigold

Marigolds are classed as African and French. The African varieties produce large, self-colored blossoms and are very effective in large beds or borders. The French have smaller flowers, and some of the varieties are beautifully striped. In beds the dwarf varieties make a fine border for the taller sorts. They are all very hardy and light the garden with a glory of yellow far into the frosts of autumn. Plants grown in boxes may be used to replace the earliest vegetables, such as the radish or spinach, in the kitchen garden, or they may be planted in tulip beds after the tulips have died down. Take up the tulip bulbs and store in a dry place for fall planting.

Sowing in boxes. Sow the seeds in boxes, in any kind of good soil. Cover to a depth of two or three times their own thickness by sifting on soil. Water thoroughly with a sprinkler and keep the box covered with a pane of glass until the plants come up. Place the box as near the window as possible and give the plants plenty of air. Transplant to other boxes, spacing them two inches apart each way. The soil may be somewhat coarse.

Planting. Plants may be set out whenever the soil is ready, from May to July. Those from two inches to a foot or more in height may be transplanted. Keep them one foot apart each way and water them thoroughly when they are planted.

Sowing out of doors. Sow the seeds out of doors in May or June, in drills one foot apart. Thin to two or three inches apart at first, later to one foot.

Culture. Marigolds need very little attention. Keep the soil free from weeds. In autumn use them liberally for cut flowers.

The Nasturtium

The nasturtium is one of the best annuals, being so easily grown that any child can plant it and take care of it. No other annual will produce such a profusion of flowers for so long a time with such a small amount of labor. It may be used as a bedding plant, in borders, or in window boxes. It is seldom troubled by insects and endures dry weather well. The dwarf varieties need no support; the tall ones grow to a height of five or six feet and for support need strings or small sticks, to which they will attach themselves by their leafstalks. As window climbers they will blossom during the winter. In the garden they may be permitted to trail over trellises or stone walls.

Soil. The soil must not be fertile, but it should contain considerable humus.

Sowing. For early plants, sow the seeds in window boxes two weeks before they are to be transplanted out of doors, and cover them half an inch deep. After all danger from frost is over, the seed may be sown in drills in their permanent place and thinned to six inches apart in the row.

Transplanting. Transplant seedlings grown in boxes when they are from four to six inches high. Set them six inches apart, whether in window boxes or in the open. They should be planted deeper than in the seed bed.

If the leaves and branches grow too rank in wet weather, remove some of them in order to keep the plants in good condition.

The Nicotiana

The nicotiana is equally valuable for the garden and as a pot plant. The flowers of the old varieties are sweet-scented and pure white. Some new ones of crimson, rose, pink, and tinted shades may be obtained.

Sowing. Sow the seeds in boxes and transplant to other boxes when they have attained a height of about an inch. If the plants are given plenty of room they may be allowed to grow quite large before they are set out of doors. With care flowers may be obtained early and the plants still continue to bloom out of doors during the entire summer. In autumn they may be taken up and used as pot plants.

The Pansy

The pansy is hardy with slight protection. It thrives best when grown in a cool place where it has plenty of moisture. The seeds may be sown in the late summer or early in the spring.

Summer sowing. In August sow the seeds in the open ground in a finely prepared seed bed. Shade the bed

until the seedlings are up. Thin to one or two inches apart and keep them well watered. In about six weeks transplant them to their permanent quarters. When freezing weather sets in, cover the bed with about three inches of straw bedding or leaves.

The seeds may also be sown in boxes and transplanted to other boxes, two inches apart each way. Keep the plants in a cellar until spring. They should be moist but not too wet. One of the best methods of keeping pansy plants over winter is to set them in cold frames.

Spring sowing. Prepare soil by screening and mixing equal parts of garden loam, sand, and manure. Place coarse drainage material in the bottom of a seed box and then fill the box to within half an inch of the top with the prepared soil. Press the surface of the soil smooth with a piece of board. Scatter in the seeds and cover to about twice their own thickness. Water through a cloth and place the box before a window, where it will get plenty of light. Keep the box covered with glass to retain the moisture and prevent the formation of a crust on the surface of the soil before the seedlings come up; remove the glass as soon as they make their appearance. Turn the box frequently, to give the plants an even distribution of sunshine and to keep those farthest from the window from growing weak and spindling. In about three weeks transplant the seedlings to other boxes, two inches apart each way. Spring sowings may also be made in cold frames in March. Set the plants in permanent places in April, six inches apart each way.

Porch boxes. Pansies make beautiful porch boxes. Set the plants in the boxes, four inches apart each way. Keep them where they will have sunshine during at least half the day.

Tulip beds. To obtain a beautiful effect, plant autumn-sown pansies in tulip beds when the tulips come up in the spring.

The Petunia

The petunia grows rapidly, coming into bloom early in the summer and blossoming until frost. Plants taken up in autumn may be used as window climbers throughout the winter. Some varieties will grow to a height of three or four feet. They give the best results in direct sunlight, but will bloom in the open on the north side of a building, where they obtain very little sun. The single varieties produce seed easily without any special attention. The double-flowered varieties will produce seed only after careful hand-pollination of the flowers. The plants may also be reproduced by cuttings.

Sowing. For early flowers, sow in boxes. Prepare a soil by mixing and sifting equal parts of earth, sand, and manure. Put coarse material into the bottom of the box to provide for drainage, and then fill to within half an inch of the top with fine material. Smooth the surface of the soil and then sow the seeds. Instead of covering the seeds with earth, merely press them down with a piece of board ; then cover with a piece of cheesecloth, and water until all of the soil in the box is moist. Cover

with a pane of glass until the young plants are well out of the ground. Keep the box in a well-lighted window at living-room temperature. When the second leaf appears, transplant to another box or to flowerpots, setting the plants two inches apart each way.

Planting out of doors. Petunias will grow in any kind of soil, but the best results may be expected when they are planted in good garden soil. Set the plants in the open when they have reached a height of from two to four inches. If they have considerable leaf growth, remove a part of it. Place them one foot apart each way, water thoroughly, and keep shaded for a day or two.

Culture. Pull up all weeds while they are small. Keep a loose layer of soil over the bed during the entire summer; a hand weeder is a convenient tool to use for this purpose.

Tulip beds. Petunias lend themselves admirably to planting in tulip beds. After the tulips are done blooming, dig them up, spade up the bed, and plant petunias in the usual way. They will afford a succession of flowers that will be attractive for school or home yards or for public parks.

Window or porch boxes. For window or porch boxes set the plants four inches apart each way. Either let them hang over the sides of the boxes or give support after they have grown a foot or more.

Flowerpots. A single plant of the large-flowered sort may be planted in a four-inch flowerpot. It will be very attractive at any time of the year for either indoor or outdoor blooming.

FIG. 48. Petunias

One of the flowers is covered with a paper bag, to guard against cross-pollination. The flower is numbered so that an accurate record may be kept

Cross-pollination. Petunias afford interesting material for experiments in cross-pollination. Plant two varieties of petunias, preferably pure white and red-purple. When the corolla is about to open, cut away a part of it and remove the stamens (as indicated in Fig. 49) and tie a paper bag over it. At the same time place a bag over another one that has not been opened. In a day or two, when the flowers open, remove the bags and with a small brush transfer pollen from the flower that contains stamens to the pistil of the one that has the stamens removed. Replace the bag over the one that has been fertilized, to let the seeds ripen. Transfer pollen from white to red-purple flowers and from red-purple to white. Continue sowing seeds from the cross-pollinated plants for several seasons, and make a note of the number of red-purple, of white, and of any mixed colors that you obtain. Seeds gathered from red-purple and from white flowers should be sown separately. The plants that are to yield seed should be kept separate, to prevent further cross-pollination. If you produce plants that bear unusually fine flowers, reproduce them by means of cuttings.

FIG. 49. Petunias

a, the corolla closed; *b*, a part of the corolla opened, showing stamens and pistil; *c*, same, with top of stamens removed

Phlox

The annual phloxes are easy to grow from seed and bloom quickly. They have a great variety of desirable colors and furnish cut flowers during the greater part of the summer. They are valuable as clumps in borders and as an undergrowth for tall, bare-stemmed plants; they may also be used for pot and box culture.

Soil. The soil should be rich. Well-decayed stable manure or leaf mold thoroughly mixed with the earth will cause the plant to make a luxuriant growth and will bring out the delicate color of the flowers. The soil should be kept moist and in good tilth during the entire summer.

Sowing. Phloxes may be transplanted easily. Sow the seeds in boxes in March or April, or in the open ground in seed beds early in May. When the ground is in good condition, transplant to a permanent place, setting the plants a foot apart each way. The seeds may also be sown in permanent beds and thinned as the plants become crowded.

There are advantages in transplanting: the soil that has been packed by the spring rains can be put into better condition; weeds may be destroyed; and the plants may be set a little deeper than those in the seed bed, thus insuring a stronger growth of roots. Weeds must be removed when they are quite small; if they are permitted to grow for any length of time, the roots of the phloxes will be loosened when they are pulled.

Poppies

Poppies are of two types, the annuals and the hardy perennials. There are few flowers easier to grow and none more useful for lighting up dark masses of shrubbery, mixed borders, or dull bits of landscape. They vary in height from one to three feet, according to the variety. The colors range from the purest white, through the delicate shades of pale pink, rose, and carmine, to the deepest crimson and blood red. Many of the blooms are daintily edged and striped.

The Iceland poppies are hardy perennials. They flower well the first season and for years afterwards. If the buds are picked just before blooming, and if the seed pods of those allowed to blossom are removed, they will continue to flower throughout the entire season.

Sowing annuals. Annual poppies do not stand transplanting easily. As early in the spring as possible sow the seeds where the plants are to stand; they are not injured by frosts. Sow thinly, covering with a very little fine soil, and press down gently with a board. The best time for sowing is in cloudy weather or after a shower. The plants will come up in a few days. After they are well out of the ground, thin them to one inch apart. When grown to a height of two or three inches, thin to from four to eight inches apart, according to the variety.

Porch boxes. Annual poppies of the smaller varieties make very pretty porch boxes. Sow the seeds in the

boxes early in the spring and thin to two inches apart each way when the seedlings are an inch or two in height.

Perennial poppies. Hardy perennial poppies should be sown out of doors in early spring as soon as the ground is fit to work. The plants disappear in July and August. When the weather gets cool they make a new growth; they may then be transplanted to their new quarters.

Salvia

Salvia splendens, or scarlet sage, is one of the most widely used of salvias. It is a brilliant red-flowering plant. It should be grown in masses and, if possible, in full sunshine, when it appears at its best. It is most effective with a dark background by way of contrast. The blooming period of plants started in boxes early in the spring is from the middle of July until frost. It may be kept over winter, but the best results may be expected if seeds are sown in boxes in March, so that strong plants may be set out in May. The seedlings should be transplanted once or twice to make a strong root growth. Out of doors set the plants from a foot to eighteen inches apart.

The colors of salvias vary with the variety. *Salvia patens* is a handsome tender perennial with erect spikes of rich blue flowers. *Salvia argentea* is a hardy perennial that blooms in the spring; the leaves are silvery and the flowers white. *Salvia rœmeriana* is an annual; the plant is of dwarf habit, with crimson flowers.

Scabiosa, or Mourning Bride

This plant is also known as sweet scabious, pincushion flower, and Egyptian rose. It is very effective for either borders or beds and is unexcelled for children's home gardens. The flowers may be used for cutting from July until late in the fall, as they are not injured by light frosts. The colors vary — red, blue, yellow, and pink in various shades are intricately netted with other colors.

Sow the seeds at any time in the spring, after danger from frost is over.

Stock

Stock is useful for bedding and edging, for pot culture, and for cutting. The average height is from one to one and a half feet. The large-flowering, ten-weeks varieties are the earliest to bloom. The perpetual varieties, known as "cut-and-come-again," send out side branches that produce new flowers after the first blooms have been cut. A great variety of colors may be obtained — white, rose, crimson, violet, and yellow in many shades.

For early flowers sow seeds in boxes in March. Transplant to other boxes when the seedlings are an inch high. Stronger plants may be obtained by successive transplantings. Move them to the garden when danger from frost is over, and set them six inches apart. For late flowers, sow seeds in the open ground in May. For winter

blooming in the house, lift late-blooming plants in the fall and put them in a cool room, where they should be kept moist.

The Sunflower

The sunflower is a very stately decorative plant and may be obtained in several varieties. The lowest are about two feet high and bear many cosmoslike blossoms with widespreading petals. The giant-flowered Russian varieties grow to a height of eight feet. Some of the double varieties bear very large and showy flowers.

A few plants may be placed here and there on the grounds with telling effect. Their golden-yellow disks make a beautiful appearance among the shrubbery, and for backgrounds and screens nothing can be finer.

Sowing. To obtain early plants, sow seeds in window boxes and transplant out of doors as soon as danger from frost is over. If the plants grow too rank, they may be transplanted a second time before they are permanently located.

Sow seeds in the open ground in early spring, placing six or eight in a hill. The hills should be from two to four feet apart, according to the variety. Thin first to three plants in a hill, and after they have made a good start, thin to one or two plants. If hills are missing or if more plants are desired, fill in with those thinned out of full hills.

Sunflowers will grow anywhere, but the strongest plants grow on very rich soil.

Sweet Alyssum

Sweet alyssum may be used wherever room may be found for a low-growing plant. It is well adapted to use as a foreground for larger plants in borders, boxes, baskets, and pots. If the plants grow long and slender, they should be cut back to produce more blooms.

Sowing. The seeds should be sown in boxes for transplanting or may be sown in the open when there is no danger of frost. For indoor use during the winter, sow the seeds in August, either in boxes or in the open, and thin to about four inches apart. Transplant to window boxes or baskets early in the autumn.

Cuttings. Sweet alyssum may also be reproduced by means of cuttings taken from strong side shoots

Sweet Peas

A row or two of sweet peas in a back yard or garden will be very attractive during the month of July and the greater part of August. The sweet pea is one of the most beautiful flowers for vases, bouquets, and table decoration. The mixed varieties will prove most satisfactory for short rows. If a row of considerable length can be planted, some of the choice named Spencer or Unwin varieties will prove interesting. Plant several kinds and give to each variety about six feet in the row.

Soil. The soil for sweet peas should be deep and rich. Spade to a depth of twelve inches and loosen

up the subsoil to a depth of another twelve inches if it is so hard that the roots cannot penetrate it easily. Thoroughly mix with the earth at least three inches of old rotted and pulverized manure. The roots of the plants will reach deep down into the soil if it has

Fig. 50. Cutting Sweet-Pea Flowers

been prepared carefully, and they will not be so susceptible to the drought and heat of midsummer as plants forced to keep their roots near the surface to obtain food.

Sowing. In order to encourage a strong root growth and hold back the top, sow the seeds as early in the spring as possible. It does not injure the seeds to be

frozen in the ground, even if germination has begun. Make the rows five feet apart. Sow the seeds one inch apart in single rows. Cover one inch deep and press the ground down firmly. When the plants are well out of the ground, thin to three inches apart.

Supporting with brush. They make their most graceful and natural appearance when they are supported by brush. Force the butts of the brush into the ground firmly, setting it in the form of a cross (see Fig. 50). The brush should be at least four feet high and tied here and there where crossed, to add strength in case of heavy winds.

Supporting with wire netting. Drive six-foot stakes into the ground to a depth of one or two feet, and to these fasten three-foot wire netting. Raise the netting about a foot above the ground, to allow cultivation between the plants.

Culture. Keep the soil loose during the entire season. A dust mulch may be kept over the surface by going over it with a garden rake at least once a week. If the soil becomes dry, make a trench about two inches deep at a distance of four inches from the row on each side. Give the plants at least a bucketful of water for every fifteen feet of peas as often as needed. When they are about four inches high, begin giving them liquid manure or a tablespoonful of nitrate of soda dissolved in a three-gallon bucket of water for every fifteen feet of peas. After the water has soaked down, always rake dry soil into the trench to retain the moisture.

Cutting. Cut the flowers liberally; the more flowers you cut off, the more blooms will form. Plants will soon stop blossoming if allowed to go to seed.

To produce extra large blossoms with long stalks, cut off all flower stalks except one or two of the strongest; also the growing tips of the vines. This will cause the plant to put forth all its strength to produce the desired flowers.

The Verbena

The verbena is a low-growing plant with a creeping habit. When grown in a mass the plants spread over the ground like a carpet, above which heads of brilliant-colored flowers appear in lavish profusion all summer. These blossoms are borne on terminal or lateral shoots, which lift themselves from five to seven inches above the ground. The verbena may be used with good effect in beds, borders, mounds, and window boxes.

Soil. The soil should be well drained and fertile.

Sowing. Sow the seeds in March in boxes. Equal parts of manure, sand, and soil, sifted and well mixed, will make a good compost. Cover the seeds a fourth of an inch deep, press down firmly, and water sparingly. When the seedlings are an inch high, transplant them to other boxes two inches apart each way. When the ground is warm and in good condition, plant out of doors, setting them ten inches apart each way. Water the plants thoroughly and shade them for two or three days.

Sowing out of doors. Verbena seeds may be sown in the open in May. Thin the plants as they become crowded.

Cuttings. Verbenas may be propagated easily by breaking off shoots five or six inches in length and placing them in soil to a depth of two inches. Water thoroughly and shade them for two or three days. Cuttings may be planted in the fall in porch boxes, where they will continue to bloom for some time after plants in the open are destroyed by frosts.

Window boxes. Verbenas may be placed in window boxes with petunias, poppies, gaillardias, and other tall-growing plants; they will serve as a border to hang over the sides of the boxes. Always keep them in a sunny place.

The Wild Cucumber

The wild cucumber is sometimes called the California cucumber. In seed catalogues it is usually listed as *Echinocystis lobata*. It is one of the quickest growing annual vines, and there is nothing better for covering trellises, old trees, old sheds, and fences.

Planting. The plants will grow in any kind of soil. Thoroughly mix a shovelful of well-rotted manure with the earth after spading it to a depth of about one foot.

Sow the seeds in autumn; for spring use soak them in warm water for a day before sowing. The young plants may be transplanted early; shade them for two or three days.

The Zinnia

The zinnia is easily grown and is an excellent plant for beginners, as failure is almost out of the question. The plants will produce brilliant and showy flowers throughout the entire season. Give them a strong, rich soil and keep them free from weeds. They are excellent to succeed tulips in beds, or they may be planted in long rows for garden borders. In school gardens they may be planted to take the place of the early vegetables after they have been harvested. They will furnish cut flowers for the schoolroom in autumn.

Sowing. Sow the seeds in window boxes about the first of April and transplant to other boxes when the seedlings are about two inches high. Set them two inches apart each way. When transplanting out of doors set them one foot apart each way. When all danger from frost is over, the seeds may be sown in drills where they are to stand. Thin to one foot apart.

CHAPTER XI

PERENNIAL BORDERS

Location. Perennial borders may be planted near the house, along walks or driveways, at the foot of terraces, around some obstruction on the lawn, or in any place that is in need of a permanent growth to improve the landscape.

Soil. The soil should be spaded to a depth of eighteen inches and mixed with rotted sod, leaf mold, or black loam if it does not contain loam. A sandy loam with an abundance of leaf mold will make the best border.

Planting. Where the lawn widens, use larger plants and give the border more space; use smaller ones for the foreground and for narrow spaces. Fill most of the space with plants that may be depended upon from year to year. These include the peony, yucca, bleeding heart, larkspur, sweet William, or any of the perennial phloxes or poppies. In making a selection, bear in mind the fact that both flowers and foliage should be abundant all the season. After making provision for this, group other plants around those chosen, as space allows. Put early spring flowers and the bulbs that die down after their blooming period in places that will be covered by the foliage of the large perennials, which are at their best during the summer and autumn months.

If you are not entirely successful in keeping the ground covered with perennials, plant annuals to fill the vacant places; they may also be used while the perennials are too small to fill their allotted spaces.

Keep the ground covered; if you do not succeed, nature will do it for you. In fact, the best way to learn how to make a border is to observe how nature does it along any country roadside.

Fig. 51. A Perennial Border
Botanic Garden, Harvard University

Begin planting as soon as the frost is out of the ground in the spring, and continue during the whole season, until the ground is frozen in the fall.

Culture. Remove all weeds from the border while they are young; pulling large weeds will loosen bulbs and roots. Keep a loose layer of soil on the surface to retain the moisture; lawn clippings or coarse manure will sometimes answer the purpose. When manure is used it must be free from weed seeds. In the fall, after the ground has frozen, rake off all the tops that have died down and cover the border with a heavy layer of

leaves or a coating of coarse manure. With the exception of some fine material, the covering must be removed in the spring when it is time for the earliest flowers to appear.

Plants that have a tendency to form clumps when they are permitted to stand in the same place from year to year must be taken up early in the spring and separated. The strongest may then be planted where they are needed. Weak plants must be removed from the border each spring, so that they may be replaced with stronger ones. Places that have been occupied with diseased plants should be filled with other varieties that are not subject to the attack of the disease.

If the border also contains shrubs, all dead wood must be removed in the spring. Shrubs that have a tendency to spread must be limited to their share of the border. The plants must be protected from the ravages of insects by spraying with lead arsenate, Paris green, or kerosene emulsion. Against leaf diseases use Bordeaux mixture.

CHAPTER XII

BIENNIAL AND PERENNIAL FLOWERING PLANTS[1]

The Bleeding Heart

The bleeding heart (*Dicentra spectabilis*) is a favorite in old-fashioned gardens. It bears its heart-shaped, rose-colored flowers on long, drooping stems through May and June. It will endure the coldest winters. The deeply cut foliage will die down to the ground in autumn.

It is a good plant to set here and there in a border, or it may be allowed to form a clump in the yard or garden. In good rich loam it will make a bush two or more feet in height.

The bleeding heart is especially valued for shady places. It is propagated by means of roots, which may be planted in early spring.

The Canna

Cannas may be grown in beds, in clumps, or as screens. If more than one kind is used, care must be taken to plant the taller-growing kinds in the center and the dwarf along the edge. Fig. 52 illustrates the method of planting a

[1] A biennial plant is one that grows the first season without blossoming, lives through the winter, flowers the second season, and dies, root and all, when it has ripened its seed. A perennial plant is one that lives and blossoms year after year.

bed of cannas with coleus as a border. If care is taken to select harmonious colors, a pretty effect may be produced. Cannas, as well as coleus, may be obtained in a great variety of colors.

When cannas are grown from seed, file each seed on the end opposite the germ until the white may be seen.

Fig. 52. Cannas with Coleus Border
One month after setting out plants

The best way to do this is to rub the seed on a piece of sandpaper tacked to a board. Soak the seeds in warm water an hour or two before planting. Sow in a box early in the spring and keep in a warm, sunny window. When the seeds are well started, transplant to four-inch pots. Young canna plants are very tender; to avoid injury in transplanting, three or four seeds may be planted in four-inch pots, which may be set in a box of sand or

soil to retain moisture. After the seeds come up, leave one strong plant in each pot. Plants grown from seeds sown in February will bloom in July.

After the leaves are destroyed by frost, take up the roots and store them in a dry place where they will not freeze. Early plants may be produced by setting roots in five-inch flowerpots in March. If kept in a warm place, the plants will make a strong growth before it is time to set them out. Roots or plants may be set out of doors when all danger from frost is over. Plant cannas in rich garden soil mixed with about half its bulk of rotted manure. Roots should be watered sparingly for a few days. After the plants are started, give them an abundance of water during the summer and keep the surface of the soil well cultivated. Lawn clippings will help to retain moisture.

The Canterbury Bell

The Canterbury bell (*Campanula*) is a hardy biennial plant that blooms the second season after the seed is sown. The flowers are large and the colors vary through shades of lilac to blue, violet, and indigo, and from bluish white to carmine rose. The blooming period is during June and July, and the flowers are especially good for cutting. The plant grows to a height of two or three feet.

Sow the seed in a light, warm soil. Keep the young plants growing all summer and cover them with leaves and coarse material in autumn. The following spring remove the covering and cultivate the soil.

The Chrysanthemum

The hardy chrysanthemum may be grown in any kind of rich garden soil. Plants that have been wintered in the open ground should be dug up when they are two or three inches high. Break them apart so that each sprout

Fig. 53. Hardy Chrysanthemum, "Sir Michael"

will have some good roots. Select a bed that is well drained, cultivate it thoroughly, and mix in a liberal supply of well-rotted manure. Set the plants eighteen inches apart.

If very large flowers are desired, let the plants develop but one stem and one bud on each stem. Remove all side shoots while they are quite small, to force all the nourishment into one bud.

To make the plant form a bush, pinch out the terminal bud when the plant is five inches high; then, after the branches have grown to a length of four or five inches, pinch out the terminal buds of the branches. Always support chrysanthemums with stakes.

Keep the plants well cultivated early in the season. In July give them a mulch of two inches of old manure. Water once a week with liquid manure until the buds begin to open. Give the plants a mulch of coarse manure during the winter, to protect the roots.

Cuttings may be used for propagating, as with the coleus and the fuchsia.

Pests. Use tobacco dust to fight plant lice.

The Coleus

The coleus lends itself to a great variety of uses — for beds, borders, edges, window boxes, and pots.

Start seeds in boxes in February or March, covering lightly and keeping in a warm place; they will germinate in about a week. When the plants have two or three leaves, transplant them to other boxes or to pots. The coleus must not be planted out of doors until the ground is quite warm, for the plants are very sensitive to cold. Pinch out flower heads and take off branches if necessary to keep the plants symmetrical. The coleus may be grown with cannas. Give the two plants the same attention.

The coleus may also be easily grown from slips started in sand and then transplanted.

The Dahlia

Dahlias may be grown in beds or borders away from large trees and the shade of buildings. The soil must be light, well drained, and moderately rich. Dig it up to the depth of a foot and thoroughly incorporate with it two or three inches of rotted barnyard manure, or mix in a handful of garden fertilizer.

Plant dahlia roots from the middle of April to the first of June. Set them from three to four feet apart, according to the variety. Pack the soil moderately around and above the roots, and cover to a depth of six inches.

To start roots in cold frames, pack them close together without separating the bunches. Cover with an inch or two of sand and give them a moderate amount of moisture and plenty of air. About three weeks after planting, or when the shoots have grown to a height of four or five inches, separate the bunches, leaving one good root with each shoot, and transplant to the garden. Set them in the soil so that almost the entire length of the shoot will be covered.

Tall varieties will require stakes about three feet high. The best time to set these is when the roots are planted. Tie the dahlia to the stake when it is a foot high. If more than one shoot grows from a root, cut away all but one or two when the plants are three or four inches above the ground. To grow large flowers, remove some of the buds. When the buds are formed in groups of three, pinch out the two side buds.

Cultivate to a depth of at least four inches close to the plants until blooms appear; then stir the surface soil, always keeping a layer of loose earth on the surface. As a rule, watering will not be necessary if the ground has been cultivated carefully. In case the soil should become dry, give it water enough to reach down to the roots, and cultivate soon after.

To increase the size of the flowers late in the season, give each of the plants a handful of garden fertilizer or a quart of liquid manure. Water thoroughly to carry the fertilizer down to the roots.

When the foliage is destroyed by frost, cut off the tops just above the ground and dig up the roots. After drying in the sun three or four hours, store the roots in a cellar where the temperature does not fall below fifty-five degrees. If the roots shrink, cover them with several thicknesses of paper and sprinkle the paper with water. If they begin to sprout during the winter, they are too moist.

The English Daisy

The English daisy (*Bellis perennis*) is excellent for edging flower beds and borders. It is sometimes planted in the grass on lawns for early flower effect. It begins blooming in May, and the flowering season may be prolonged by cutting the faded blossoms. By keeping the plant in good growing condition fresh flowers may be had during the greater part of the summer. The blossoms are double or semidouble, and the color varies

from white to pink. The plant is from three to five inches high. It loves a shady place and will bloom for several years if left undisturbed, although the best results are usually obtained by sowing seeds each year.

Fig. 54. English Daisies in a Tulip Bed

Sow the seeds in July or August. Keep the seed bed shaded until the plants are well out of the ground. They may be transplanted to the bed where they are to stand or may be changed to their permanent quarters early in the spring, but they must be protected in cold weather. The seedlings may be grown in cold frames and given the same care as is given to violets.

The Foxglove

The foxglove (*Digitalis*) has tubular flowers of various colors, produced in long spikes. The plant grows from three to five feet in height; it is highly ornamental and hardy, succeeding under most conditions. If the flowers are cut freely, it will continue to bloom from June until late in the summer. It is a good plant to set in a border among shrubs.

In the spring sow seeds where the plants are to remain, or the plants themselves may be obtained from seedsmen. The foxglove thrives best in a light, warm soil.

The Gladiolus

The gladiolus gives a wealth of color equaled by few other flowers. It is easy to grow and does well in any soil but should be planted with full exposure to the sun. Its neat, erect, and graceful growth makes it suitable for any garden, and its gorgeous colors are most effective. It may be planted in clumps, beds, or borders. In beds, plant bulbs in rows a foot apart and four inches apart in the row. For clumps and borders, set the bulbs five or six inches apart; put them in right side up, press the earth firmly around each bulb, and cover five or six inches deep. For a succession, plant from the time the ground can be worked until the first of July. Blooms will continue to come from July until frost if bulbs are planted in this way. Keep the soil thoroughly worked.

If watering is necessary, enough must be given to reach the roots. Cultivate the soil soon after watering.

For early blooming, start bulbs in sand in four-inch flowerpots and transplant after the plants have become hardened and when all danger from frost is over.

The finest specimens for vases are obtained if the flower spike is cut when the first buds open. Every bud on the stalk will open after it is brought into the house.

Clip off withered blooms to force strength back into the bulb, and dig as soon as the foliage turns brown or is destroyed by frosts. The stalk should be cut close to the bulb. Dry the bulbs in a cool place and store them in baskets at a temperature as near forty degrees as possible.

Pests. If the leaves are troubled by plant lice, give them a liberal application of tobacco dust.

Golden Glow

The golden glow (*Rudbeckia*) is a very hardy plant, producing large, showy, golden-yellow flowers in abundance from July to September. It grows to a height of from five to seven feet and may be used as a screen or in a border, where it makes a very effective background for other perennials.

It prefers a moist, rich soil. Strong plants that bloom the first season may be produced by setting out roots early in the spring. Transplant often to keep up a supply of large flowers from year to year.

The Hollyhock

The hollyhock (*Althæa rosea*) is a well-known garden favorite. It makes an excellent back-yard screen and is very effective in rows along fences. It may also be planted in clumps or among shrubs that bloom earlier

Fig. 55. A Hollyhock Screen for a Back-Yard Fence

in the season. The flowers are double or single, in shades of white, pink, deep red, orange, or yellow. Hollyhocks succeed best in rich, well-drained soil. They should be protected during the winter with a light covering of straw or other mulch not likely to rot. In the spring remove the coarse covering and spade some of the fine material into the soil.

Sow seeds in June or July to obtain good plants for blooming the second summer. Some varieties will bloom very late the first season if the seeds are sown early in the spring.

The Iris

Native varieties of iris may be found in nearly all sections of the United States. *Iris versicolor*, or the large blue flag, is an excellent plant for the edge of a pond or for a marsh that is covered with water during the spring. The flowers are violet-blue, variegated with green, yellow, or white, and are purple veined. The stem is stout and angled on one side. After the blooming period the sword-shaped leaves make a luxuriant growth. *Iris germanica*, the true fleur-de-lis, may be grown in gardens under ordinary culture if given rich soil and an abundance of water. The finest blooms are obtained from established clumps; consequently they should remain undisturbed after planting. Set the roots in clumps of three or more, four inches deep and protected with leaves or other mulch during the winter. *Iris kæmpferi*, or Japanese iris, has very large flowers of beautiful shades. This is considered one of the best varieties either for borders or for bedding. The prevailing colors are white, crimson, rose, lilac, lavender, violet, and blue. Each flower usually contains several shades. Give it the same attention that is given the German iris. Plants may also be produced from seed.

Larkspur

Larkspur (*Delphinium*) is very effective when planted in borders, among shrubbery, or along a carriage drive. It makes fine cut flowers, lasting for some time in water. By cutting off old stalks after flowering and by watering the plants a supply of blooms may be had during the greater part of the summer.

Fig. 56. Larkspur (*Delphinium*)

Sow the seeds in boxes in early spring. Transplant when the seedlings are nearly an inch high. Plant them three or four inches apart each way. Move the boxes out of doors several days before transplanting, protecting them against cold winds; this hardens them and will prevent any setback later. When planting in the open, set them in rich, well-prepared soil, six or eight inches apart; they will bloom the first season. Mark the best plants, and the following spring set them where they are to stand permanently, placing them two or three feet apart. In two or three years they should be

taken up and reset. Spade the soil to a depth of at least twelve inches and mix with it a liberal supply of well-rotted manure.

The seeds may be sown in the open as soon as the ground is warm in the spring; by the end of July transplant the seedlings to six inches apart. Early the next spring again transplant them to their permanent places. Plants set out in the spring will not be likely to flower before the second season.

Sift coal ashes over the ground in the spring and fall to protect larkspur from white grubs.

Phloxes

There are numerous varieties of cultivated perennial phloxes; they are all very hardy and succeed in any kind of garden soil. With comparatively little care they may be made to produce large clusters of flowers year after year. They are all excellent border plants. Some grow as tall as four or five feet, while others reach a height of only six inches. The flowering period is from early July until the middle of September. The range of color is very wide, and the best effect may be produced by planting masses of each color. The flowering period may be extended by cutting off old flower stalks and giving the plant a liberal supply of water. Transplant roots early in the spring, or sow seeds in July or August and transplant the seedlings, so that they will become well rooted before winter sets in; early in the spring set

them in their permanent position. Strong plants may be produced by forking manure into the soil around them early each spring. Cultivate the soil after rains.

The Peony

Pæonia officinalis is the original peony of old gardens. Although it is still a favorite, there are many hybrid

Fig. 57. Peony (*Pæonia albiflora*)

varieties that are more popular. It has an attractive, deep-green, divided foliage with semidouble, sweet-scented flowers.

Peonies may be grown in beds, especially for cut flowers, in the perennial borders, or among shrubbery. They will thrive in bright sunlight or in a spot that is partly shaded.

The soil should be rich and deep. Cover the crowns of the roots to a depth of two inches, and give them an abundance of water during the growing season. In autumn give the plants a heavy mulch of coarse manure; the following spring remove the coarsest material and fork the fine manure into the soil. During the summer, lawn clippings may be thrown about the plant to retain moisture and keep down weeds and grass under the leaves.

Pinks

The sweet William (*Dianthus barbatus*) grows a foot or more high; the flowers are pink, red, and white. It is common in old gardens, where the roots have stood for years. The rich and variegated flowers produce an excellent effect in beds or borders. To obtain strong plants with large blooms it is better to grow from seeds sown early in the spring than to propagate by dividing old roots. *Dianthus chinensis* produces very fragrant flowers and is an excellent border plant, growing to a height of from six to eight inches. *Dianthus plumarius*, the double garden pink, has a dwarf and compact habit and bears fragrant double flowers of deep red, pink, and purple-white. It is a good border plant, the blooming period being in May and June. The Scotch pink, with its fringed petals, is an excellent plant for the rock garden. All the dianthuses are quite hardy; they like the sun and will thrive in any good soil. They may be reproduced either from seed or from roots.

Primrose

The English yellow primrose (*Primula vulgaris*) is a good plant for a shady border or for a north exposure. Its color is pale yellow, and it grows from six to eight inches high. The soil should be light and well supplied

Fig. 58. Primrose (*Primula vulgaris*)

with leaf mold. During the winter it should be protected with a covering of leaves, straw, or coarse material.

Sow the seeds in September in a seed bed or a cold frame. Transplant once in the seed bed, to keep the plants from crowding and to encourage a stronger root growth. In the spring set out the plants in well-prepared soil. Flowering usually occurs the first summer, but the blooms are more beautiful the second year.

The Pyrethrum

The handsome, fernlike foliage of pyrethrum, its showy flowers, and its great hardiness make it one of our most valued border plants. Its worth is enhanced by the fact that the flowers are excellent for cutting.

The plants bloom in June, and if they are fed liberally with liquid manure or bone meal they will blossom again in September.

Sow the seeds either in boxes or in the open and give the plants the same attention as is given to larkspur.

The Yucca

The *Yucca filamentosa* (Adam's needle) is a very attractive plant and may be used as a single specimen in the lawn where a plant of low growth is desired. The flower stalk, surrounded by swordlike leaves, grows to a height of from three to five feet. The flowers are large and greenish white. The plant blooms in midsummer and early autumn. It will thrive either in full sunlight or in a partly shaded place. The plant needs no special protection during the winter, as it is entirely hardy.

Sow seed in early spring or set out plants that may be purchased from dealers.

CHAPTER XIII

WILD FLOWERS

The Anemone

The Canada anemone (*Anemone canadensis*) is a Northern species with a coarse stem. The leaves are broad, sharply toothed, and three-cleft. The under surface of the leaf is hairy. It grows in low, moist ground along the banks of streams and on prairies. It may be used as a border plant in the open or at the foot of rockeries, where it will obtain an abundance of moisture. The plant grows from one to two feet high in heavy, black soil and, when once established, spreads rapidly. A number of the plants in a cluster, with their large white flowers, make a very pretty appearance. Transplant roots in the fall or early in the spring when the soil is moist.

Fig. 59. Canada Anemone (*Anemone canadensis*)

The windflower, or wood anemone (*Anemone quinquefolia*), makes its appearance in open woods early in the spring, before the foliage has closed in the spaces

Fig. 60. Wood Anemone (*Anemone quinquefolia*)

overhead. It is well adapted to borders containing shrubbery or to the north side of a rockery. The soil must be light and well supplied with leaf mold. It is reproduced by

means of a thickened, filiform, whitish or brown rootstock. The plant will bloom the first season if considerable soil is taken up with the roots early in the spring.

The rue anemone (*Anemonella thalictroides*) rises from a cluster of thickened roots; it lives in the open woods under the same conditions as the windflower. The white or pinkish flowers (in groups, generally of three) are poised on stems that are very slender and spring from the leaf whorl.

Transplant the same as the windflower.

Fig. 61. Bloodroot (*Sanguinaria canadensis*)

The Bloodroot

The bloodroot (*Sanguinaria canadensis*) is a pretty but fragile plant that blooms very early in the spring. It likes moist, sheltered places on rich north hillsides. The thick, prostrate rootstock sends up a lobed leaf and a stem with one handsome white

flower. It derives its name from the red-orange, acid juice that flows out of the root when it is injured. A clump of bloodroot sending up its stalks of pure white flowers makes a pretty picture. The thickened roots may be transplanted at any time after the leaves die down in the summer, or early in the spring.

The Bluebell

In planning a rockery or a border the wild bluebell (*Mertensia virginica*) should not be overlooked. Its handsome, nodding, purplish-blue flowers are raised in loose clusters about a foot above the ground; it thrives in the shade in rich, loamy soil. The thickened roots may be transplanted in the fall or early in the spring.

The bluebell would serve as an excellent companion plant for the star of Bethlehem, with its delicate white, spreading flower. The star of Bethlehem is reproduced by bulbs, which may be transplanted after the foliage dies down.

Bluets

Bluets (*Houstonia cærulea*) usually grow in the open on moist, grassy hillsides. The flowers are light blue, pale lilac, or nearly white, and appear in May and June.

Even after the plants have begun to bloom, clumps growing in the grass may be taken up and transplanted. They will continue to blossom if kept moist. Place the masses very close together, so they will form a carpet over the ground.

The Columbine

The wild columbine (*Aquilegia canadensis*) is found growing in the clefts of rocks, on sunny heights, and along banks. It is an excellent plant for the dry side of a rockery or for the open border. The nodding flowers are scarlet with yellow inside, and the tips have a tendency to become crimson; the many long stamens hanging in the center are very yellow. *Aquilegia cærula* is a native of the Rocky Mountains. Its blossom is blue-white, and occasionally pinkish, and is sometimes three inches broad.

Transplant the columbine roots early in the spring. If root masses are taken up with soil and transplanted to the garden when the leaves appear above the ground, they will bloom the first season.

Dutchman's Breeches

Dutchman's breeches (*Dicentra cucullaria*) grows in the shade in leaf mold, where it obtains an abundance of moisture; it is well adapted to moist rockeries or shady borders. The delicate green leaves are finely cut and the stems are juicy. The flower has an unusually interesting structure. The petals are four in number, one pair being joined together to form a two-spurred, heart-shaped bag, with its spurs spread wide apart; the other two petals, held within the narrow mouth of the bag, are very small and join their tips over the

FIG. 62. Columbine (*Aquilegia canadensis*)

stamens, which protrude slightly. The color of the petals is pure white; the spurs are tipped with pure yellow. A row of nodding flowers is held up by the pale or red-tinted stem.

As soon as the leaves make their appearance, dig up the mass of scaly bulbs with a clump of earth and transplant them. If the plant is kept moist and in a protected place, it will bloom in May.

FIG. 63. Dutchman's Breeches (*Dicentra cucullaria*)

GOLDENROD

More than fifty varieties of goldenrod (*Solidago*), the American national flower, are found in the United States and Canada. While the plant is in bloom during the summer, select the kinds you prefer. Late in the fall or early in the spring transplant the clumps of roots with as much soil as possible.

If it is necessary to buy plants, *Solidago sempervirens* is a good variety; it grows to a height of about three feet. The foliage is heavy and the flower spikes are about a foot in length. It is very attractive in clumps with asters, among shrubbery, or in wild gardens. Another very showy variety is *Solidago rigida;* it thrives among shrubs or in sandy places. *Solidago altissima* and *Solidago canadensis* are both good varieties that may be obtained from dealers. They will be effective either in rich open soil or in borders.

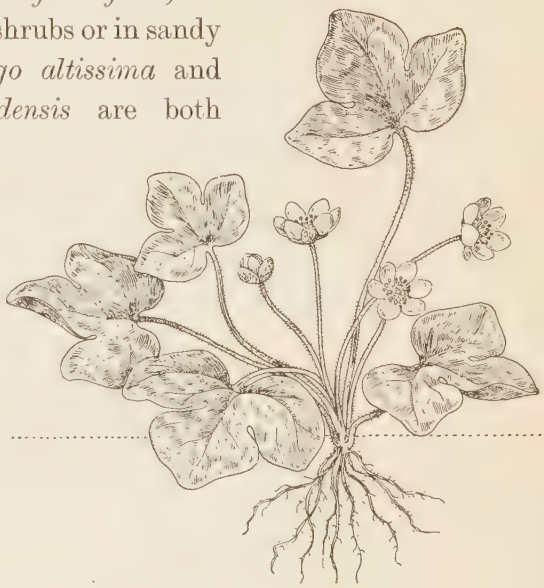


Fig. 64. Hepatica (*Hepatica triloba*)

The Hepatica

The hepatica is one of our earliest wild flowers, thriving in woods on north hillsides and in sheltered places. As a border plant or in rockeries it may serve as a companion to the early trillium, snowdrop, and crocus. The leaves remain on the plant during the winter; the new ones make their appearance later than the flowers. The blossoms of the native varieties are blue, purplish, or nearly white.

Late in the fall or early in the spring take up clumps with a mass of soil clinging to them, and set them in a sheltered place, where the roots can penetrate a light soil containing an abundance of moisture. During the winter protect the plants with a covering of leaves.

Fig. 65. Indian Turnip (*Arisæma triphyllum*)

The Indian Turnip

Nearly every one is familiar with Jack-in-the-pulpit (*Arisæma triphyllum*). He comes early, always occupies a prominent place in the woods, and even ventures into the open. He is at his best in deep, rich soil well supplied with leaf mold. The short, thickened root-stock that sends up the stem is called a corm. Take up the corm very early in the spring and plant it in the shade where it will obtain an abundance of moisture.

Late in the summer the bright-red berries will prove to be as interesting as the flowers were in May. Young plants may be grown from the berries and are at their best the second or third year.

The Lady's Slipper

The lady's slipper is usually found in damp woods, swamps, or bogs. The large yellow kind (*Cypripedium pubescens*), the stemless variety (*Cypripedium acaule*), with a crimson-pink flower, and *Orchis spectabilis*, with a white or magenta-pink flower, may all be transplanted easily if given their native environment as nearly as possible. The plants all bloom in May and June. They are very pretty placed on the shady side of a rockery. Transplant them early in the spring or after the leaves die down in the summer.

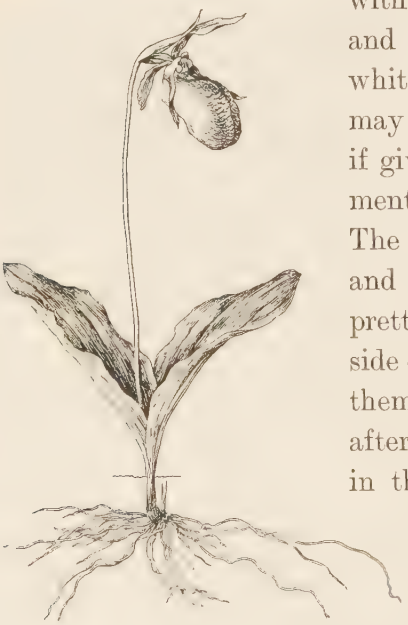


Fig. 66. Lady's Slipper (*Cypripedium acaule*)

The Lily

Of the many kinds of lilies suitable for borders the native plants should attract our first attention. The low-growing ones will give us little surprises, blooming here and there in the foreground or in a convenient nook early in the season, while the tall ones will occupy prominent places later in the summer.

The wild orange-red lily (*Lilium philadelphicum*) is one of the most beautifully colored wild lilies. It grows in the rich Western prairie soils and in bogs, and is from two to four feet high. It has an open, bell-shaped flower, of a reddish-orange color, spotted purplish inside. If transplanted, it may be grown in dry soil in the border among low shrubbery. Plant bulbs either in late fall or early spring.

Fig. 67. Turk's-Cap Lily (*Lilium superbum*)

The Turk's-cap lily (*Lilium superbum*) holds its large orange flower cup, with numerous dark-purple spots inside, in a half-drooping position. It grows in rich, moist woods and in wet meadows. In borders among shrubbery it will attain a height of from four to seven feet. This is a very fine lily to grow in a moist corner with lower plants in front of it. *Lilium carolinianum* is a Southern plant closely related to it and is found in dry woods among the mountains from Virginia south to Florida. Its height is from two to three feet. Bulbs of both varieties may be planted either in the fall or in early spring.

The wild yellow lily (*Lilium canadense*) has narrow, bell-shaped flowers on long peduncles and is very fragrant. The petals are yellow or orange, usually spotted with brown. In its native haunts in the Northern states it grows in moist meadows or bogs. As a border plant it may be grown in moist, light soil and in full sunlight.

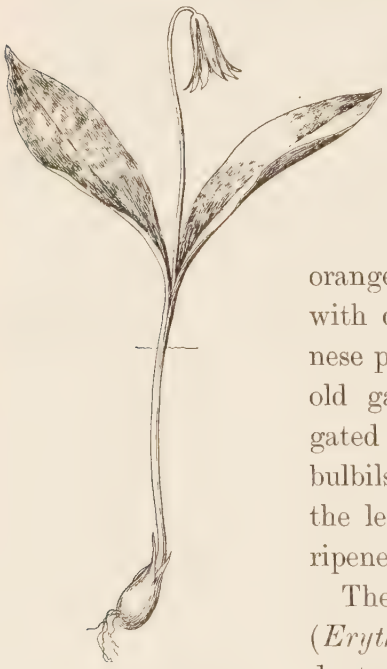


Fig. 68. Dogtooth Violet (*Erythronium americanum*)

The tiger lily (*Lilium tigrinum*) has large, deep-orange flowers thickly spotted with dark brown. It is a Japanese plant that has escaped from old gardens. It may be propagated by planting the little black bulbils, found in the axils of the leaves, when they are fully ripened.

The white dogtooth violet (*Erythronium albidum*) and the dogtooth violet (*Erythronium americanum*), sometimes called the yellow adder's-tongue, with its mottled leaves and light-yellow petals, are both excellent plants for growing in shaded rockeries and among shrubbery. If grown in the open, they prefer a northern slope. The flowering season is from April to May.

The bulbs grow from five to six inches deep. They may be taken up and transplanted at any time after the leaves die down. If they are to be kept out of the ground for several days, they must be packed in moist paper or moss. They lose their vitality if allowed to dry out. Set the bulbs in moist soil to a depth of four or five inches.

The lily of the valley (*Convallaria majalis*), with its little white, sweet-scented, bell-shaped flowers, will be at its best in deep, rich soil well mixed with leaf mold. This plant is reproduced by means of its slender, running rootstocks, commonly called pips. Set out the pips about the last of October and protect with leaves during the winter. After the bed becomes crowded, take out and transplant some of the pips.

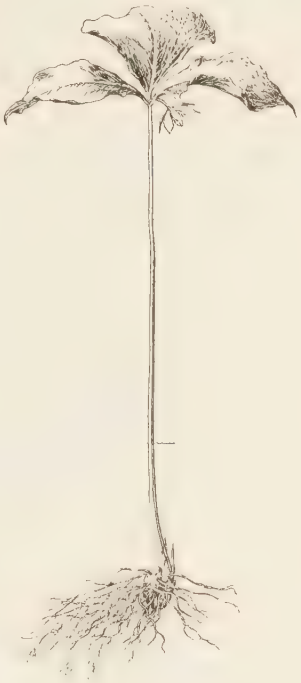


Fig. 69. Nodding Trillium (*Trillium cernuum*)

There are several varieties of Solomon's seal and of trilliums that are very beautiful on shaded rockeries or borders. *Trillium cernuum* has broad leaves and white or pink flowers. Both the Solomon's seal and the trillium are reproduced by rootstocks, which may be transplanted in very early spring or late in the fall.

Phlox

Phlox amœna is a very pretty plant that may be found native on the dry hills and barrens from Virginia west to Kentucky and south to Florida. Its deep-pink flowers make their appearance in May, and the flat clusters almost completely cover the plant. In a border that is to contain a succession of blooms it may be used as one of the medium early flowers. Another excellent native variety, well suited to the conditions of borders or rockeries in the northern part of the United States, is the ground pink, or moss pink (*Phlox subulata*). It sends out creeping stems with narrow leaves, forming a mat over the surface of the soil; it spreads vigorously where taller plants do not crowd it. The flowers are sometimes pink-purple or rose color, with a dark center, and sometimes white. The plant grows

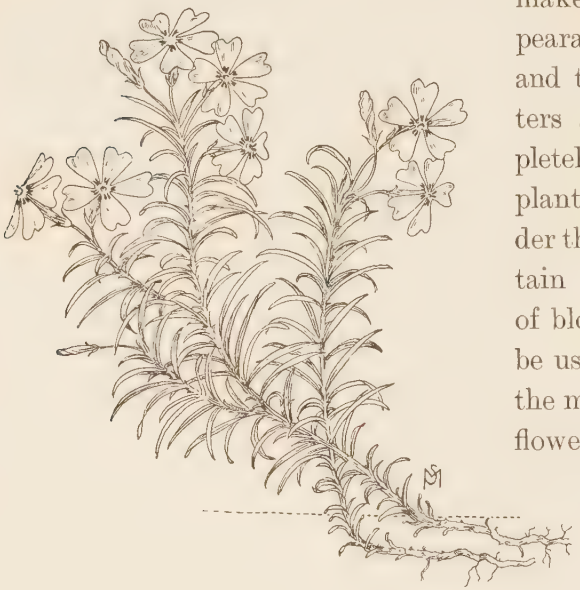


Fig. 70. Moss Pink (*Phlox subulata*)

native on dry, rocky hills and sandy banks from New York west to Illinois and south to Kentucky and Florida.

For transplanting native phlox, take up clumps, with as much soil as will cling to the roots, early in the spring when leaves begin to form. The plants will bloom the first year, though better results may be expected after they have become established.

Fig. 71. Spring Beauty (*Claytonia virginica*)

The Spring Beauty

The spring beauty (*Claytonia virginica*) is a very delicate plant, making its home in rich, moist woods where the soil is clayey. It sends up smooth, threadlike stems from deep tubers, bearing a pair of opposite leaves and several flowers. Its flower is rose color with veins of deeper pink starting from a yellow center. Transplant tubers at any time after the foliage dies down in summer. To take up plants in the spring, cut the soil around each to a depth of four or five inches, with a trowel or spade, lift out a clump containing a plant, and reset without disturbing either the roots or the delicate stems. This may be easily done when plants grow in the sod, as they sometimes do. Blooms may be

expected the first season. If the stem is not crushed when it is transplanted, there will be an abundance of food in the tuber to keep up the growth of the plant.

Fig. 72. Blue Violet (*Viola palmata*)

The Violet

Viola cucullata likes moist places; it will often do well near water. There is a violet form, a white, and a pale mauve; all the colors darken near the throat. All of these kinds are admirable in borders between other plants.

Viola papilionacea is found in the grass in meadows and along roadsides everywhere in May and June. The petals of the flowers vary in color from deep violet to greenish yellow or white. It is a very interesting plant when established in a corner of a grassy yard. It prefers a soil not too dry.

Viola palmata has palmately lobed, or parted, leaves and violet-purple flowers. It thrives in dry, rich woodland.

The bird's-foot violet (*Viola pedata*) blooms a little later than the meadow violet. It makes its home on dry banks and in gravelly soil, but may be made to grow in a rockery or border if care is taken to give it a home-like situation. The leaves and flowers are borne on slender stems rising from a short rootstock. The color of the blossom varies from deep red-violet to pale lavender, with some white at the base of the lower petals, just underneath the green-tipped pistil. The plant forms little clumps. In order to transplant successfully, dig up an entire clump with as much soil as possible clinging to the roots.

FIG. 73. Bird's-foot Violet (*Viola pedata*)

Viola rotundifolia (the early yellow violet) may be transplanted by taking up the stout rootstock early in the spring. It has oval, heart-shaped leaves. The petals

are bright yellow; the three lower ones have brown veins and the lateral ones are bearded. *Viola odorata* (the sweet violet) has very fragrant purple flowers. It may be transplanted easily in the spring, and it is often set in flowerpots when the blooms are about to open. It may be taken up with a clump of earth without injury to the flowers at any time during the summer.

Native violets may be transplanted into almost any kind of soil, from swamps to the driest hilltops, but each plant must have its own needs supplied. Any of them may be made to bloom the first season, but success in establishing and keeping them growing from year to year depends entirely upon giving each, in its new quarters, the conditions under which it lives when selecting its own location.

CHAPTER XIV

NATIVE FERNS

Ferns have their native haunts in rock crevices and among the roots of vegetation, where moisture is easily retained and where they are at least partly sheltered from

FIG. 74. Ferns near the Front Door
The house faces toward the north

sun and wind. The leaves of trees and shrubbery which fall on the roots each autumn serve as a protection from the cold during the winter; the following summer they

make a covering, to help the soil retain moisture, and later they produce the leaf mold that serves as food.

As garden plants, ferns are proper occupants for wooded spots, rockeries, the north side of buildings, or for places that are too shady for flowers but would be

Fig. 75. A Fern Rockery in the Boston Public Garden

improved by some fine foliage. Wherever ferns are planted, partial shade is necessary; there must also be a good supply of moisture in the soil.

All of the larger ferns will grow in good mellow, loamy soil, but the smaller kinds need a sandy loam or a sandy peat. Where the soil is inclined to be clayey, good peat must be supplied before a fine growth of ferns can be obtained.

If ferns are grown on rockeries, there must be special crevices between the rocks, so that the roots can strike deep down into the soil that has been prepared for them. Every fern rockery should have a depth of from one to two feet of sandy peat mixed with an abundant supply of leaf mold, to afford a roothold and to supply the necessary moisture and food.

Ferns may be transplanted after the leaves fall in autumn, or in the spring before the leaves open. Spring transplanting will not retard the growth materially if all the soil which clings to the roots is taken up with them. Set the plants as deep as they stood in their native places. The leaves will not unfold readily if the crowns are covered with soil. Keep leaf mold around them and give them an abundance of water.

CHAPTER XV

PLANTING SHRUBS AND TREES

Season for planting. Shrubs and trees may be planted either in the fall or in the spring. Fall planting is best in most sections, as it gives the soil an opportunity to settle around the roots, so that growth will begin early in the spring. If trees or shrubs are planted in the spring, they must be in a dormant condition. The planting season depends entirely upon the condition of the stock to be planted, so that no definite date can be set. If a tree has been properly grown in the nursery, and if it is in a dormant condition when delivered, and is then properly planted and cared for, its successful growth is assured.

Heeling-in stock. If trees are purchased in the fall, or if the soil is not ready for them when they arrive in the spring, they may be heeled-in until the ground is ready. Select a spot somewhat protected from severe weather and sudden changes of temperature. Dig a trench from one to two feet in depth, according to the size of the stock, and wide enough to take the roots without crowding. Make a sloping bank on the south side. Open the bundles and place a layer of shrubs or trees on the sloping bank with their roots in the trench. Cover the trees to the very tips with well-broken soil, taking care

that plenty of loose soil is shaken in among the roots. Tread the soil firmly on this layer; then add another layer, and another, until all of the stock is disposed of. Cover with a mound of earth. Small trenches must be dug on each side to drain off surface water.

Preparing the soil. The same precaution taken in preparing soil for lawns is necessary for success in growing shrubbery and trees. Spade the soil to a depth of twelve inches, working in at least two inches of well-rotted barnyard manure. Use a garden line to make all edges straight. The turf must be cut carefully along the sides, so that the lawn will not have a ragged appearance after spading.

Setting shrubs and trees in rows. Stretch a garden line parallel to the line in which the shrubs or trees are to stand, and two feet away from it, so that it will not be in the way when planting. The holes can then be made and the shrubs or trees put in place by measuring with a ruler the distance that each must be from the line.

How to plant shrubs and trees. Make a hole large enough to receive all the roots without bending. Trees should be set two inches deeper than they stood in the nursery. Plant small shrubs about the same depth that they had in the nursery.

After all bruised and broken roots have been removed, dip the bunch of roots in thin mud prepared by stirring rich soil into a pail of water. Set the plant so that it will be in line and fill in the hole with fine, moist earth. Make the soil firm around the roots with the hand.

Care must be taken that there are no air pockets and that the roots are not crowded together. When the hole is half full, tread the earth in firmly; then fill in until the hole is nearly full, and tread again. On top strew at least two inches of fine soil. This must be kept loose during the entire summer by working with a rake or hoe after rain; it will make a dust mulch to retain the moisture. In the fall give the soil a top-dressing of leaves, straw, or coarse manure.

Watering. If the soil is dry when the trees are being planted, pour from one to five gallons of water in the hole when it is two thirds filled with soil. After this water has been absorbed by the soil, continue filling the hole. It may also be necessary to water the trees during the dry season in July and August. Trees should then be given an abundance of water, so that it may reach all of the roots. Water may be poured in a four- or five-inch draintile that is set in the soil so that the upper end is a short distance above the surface. Large trees are sometimes watered in this way. The famous Washington elm at Cambridge, Massachusetts, has draintiles laid among its roots and is supplied with water from the city water system during the hot summer days.

CHAPTER XVI

SHRUBS

The Azalea

Azaleas are without exception the most showy of flowering shrubs. They are dwarf in habit and may be planted with other shrubs or grouped in masses. Plant them in the spring in deep leaf mold and keep them moist during the summer. They are hardy, but it is best to place a covering of leaves around the plants in autumn. *Azalea nudiflora* has sweet-scented and very showy light-pink flowers; it grows from six to eight feet high and blooms in May. *Azalea viscosa* (white swamp honeysuckle) blooms in June. On account of the intense fragrance of its white flowers it is valuable as a border plant among other shrubbery. *Azalea arborescens* (smooth azalea) is very fragrant and showy, with handsome dark-green foliage, producing white and rose-tinted blossoms late in the summer. It is suitable for planting in borders with other shrubs, and it can be easily grown in any ordinary soil. *Azalea mollis* has a dwarf habit and bears large flowers in all shades of red, white, yellow, and orange. It thrives in sunny situations, and it may also be grown under partial shade. The blossoms come before the leaves and literally fill the plant with a mass of beautiful colors.

The Barberry

The Japanese barberry (*Berberis thunbergii*) is the best shrub for protecting corners. It may also be used as a hedge plant and for growing in masses for fall and

Fig. 76. Corners protected by Barberry Bushes
Agassiz School, Cambridge, Massachusetts

winter effect. The foliage turns scarlet in autumn. Its yellow flowers are followed by scarlet berries, which remain on the bushes until the leaves begin to appear in spring. When using it as a hedge, or on corners, as indicated in Fig. 76, set the plants about two feet from the walk and two and one-half feet apart in the row.

In the spring remove all dead wood and shear the bushes so that they will have a round top. Never shear them during the summer or autumn, for clipping at any other season than spring will interfere with the attractiveness of the red berries the following winter.

Fig. 77. A Barberry Hedge

The plants were set out in March; the photograph was taken the following August

When planting, prepare the soil to a depth of a foot or more; mix with it a liberal supply of well-rotted manure. Keep a strip at least a foot wide cultivated on each side of the hedge during the summer. Keep a loose layer of soil around the plants during the entire summer, and mulch with lawn clippings.

The Carolina Allspice

Calycanthus floridus, commonly known as Carolina allspice, from the fragrance of its flowers and foliage, grows in a compact bush from four to six feet in height. It is perfectly hardy, even in the Northern states, and will thrive in any soil. The double purple flowers are pineapple scented. The petals are somewhat fleshy. The blossoms appear early in the spring and remain until well into the summer. The bush will do well even when almost entirely in the shade of trees or larger shrubs.

The Deutzia

Deutzias are very pretty. The low-growing varieties are valuable for small grounds or for fitting into spaces among larger shrubs. Cut the branches back to preserve a well-balanced head. *Deutzia gracilis* is one of the smallest, growing to a height of from two to four feet. It has numerous slender branches and is covered with snow-white blossoms in May or June. *Deutzia rosea* is a variety that closely resembles *Deutzia gracilis*; it bears light rose-colored flowers in profusion. *Deutzia crenata flore-plena* blooms in June, producing numerous very double white flowers tinged with purplish rose.

Deutzia lemoinei produces pure white flowers that are borne on stout branches which have a tendency to grow upright. It flowers very freely and is quite hardy.

The Flowering Almond

The flowering almond (*Prunus japonica*) is closely related to the peach and apricot and is a good plant for the shrubbery border. In May it is covered with showy double flowers, the variety *Alba plena* bearing white and *Rosea plena* pink blossoms. They make their appearance along the branches and twigs before the leaves appear. The height varies from three to five feet. Both varieties are very hardy, growing rapidly, and will do well in any kind of soil.

The Flowering Currant

The flowering currants (*Ribes*) are all very hardy, of rapid growth, and thrive in any good soil. *Ribes alpinum* (the mountain currant) is a dwarf plant of compact habit, and *Ribes aureum* (the Missouri currant) is of medium size. Both bear large clusters of fragrant yellow flowers in May. The leaves of the latter are especially attractive in autumn, turning to a bright crimson tint. *Ribes sanguineum* has smooth red branches and dark-green leaves. Its carmine flowers, of very fine color, appear somewhat earlier than the preceding varieties.

Prunus pissardi, or purple-leaved plum, is one of the best red or purple-leaved shrubs. It sometimes grows to the height of a small tree.

Pests. Currant worms may be destroyed by spraying the leaves quite early with Paris green or arsenate of lead.

The Forsythia

The forsythia (*Forsythia suspensa*), sometimes known as fortune's golden bell, blooms very early. The long, willowy branches arch gracefully over to the ground and

Fig. 78. Shrubbery in a Front Yard

The situation is unfavorable for growing grass. Barberries and other low-growing bushes are planted in the foreground; forsythia and other taller shrubs are placed near the building

are covered to the tips with trumpet-shaped yellow flowers, which are produced on the wood of the previous year's growth. Cut the plants back each year immediately after blooming, which is before the foliage shows much. Nearly all the wood of the previous year should

be cut away; new shoots, that will bear the next season's flowers, will take its place. The forsythia may be grown as a single plant or in a clump in a corner. It is entirely hardy and will thrive among other shrubbery in any kind of soil.

The Hibiscus

The *hibiscus syracus*, or rose of Sharon, may be obtained in several varieties, which are all valuable on account of their blooming period, which extends from August to October, a season when there is a scarcity of flowering shrubbery. Both double and single varieties in white, pink, red, lavender, and purple may be procured. Plant them in sheltered places among shrubs where they will obtain plenty of moisture, and give them a mulch of leaves during the winter. Spring planting is best.

The Hydrangea

The hydrangeas are among the best of our ornamental shrubs. In the Northern states few are sufficiently hardy to withstand the winter, but in the South the tenderest kinds may be cultivated in the open without difficulty. *Hydrangea paniculata grandiflora* is perfectly hardy and needs no protection during the winter. Its large heads of creamy-white flowers make their appearance in July, changing to purplish pink late in the summer. In spring cut back almost to the ground; new shoots will appear, every one of which will bear a cluster of flowers. A single plant may be allowed to grow to

the desired height and trimmed to form a round head. *Hydrangea hortensis* is commonly used in tubs or pots for piazza and garden decoration. Its foliage is heavy dark green, and the blossoms change from creamy white

Fig. 79. *Hydrangea hortensis*

to rose color and sometimes blue. Keep these plants in the cellar during the winter, and give them just water enough to keep them from shrinking. Trim back in the spring to cause new blooming shoots to form.

The Magnolia

The magnolias are very profuse early bloomers. They are comparatively hardy but do best when planted in a protected place. They should be planted in loamy soil containing an abundance of leaf mold and well supplied with moisture. Always set the plants out in the spring and protect them for a year or two. *Magnolia stellata* (Hall's magnolia) is a dwarf variety growing to a height of six or eight feet. It grows slowly but blooms while small; the spreading branches are covered with white flowers in April, the blossoms being from three to four inches across and fragrant. *Magnolia soulangeana* grows to a height of from ten to fifteen feet. It is well adapted to lawn planting. The leaves are about six inches long, and the purple-white flowers, four or five inches across and sweet-scented, appear in May. There are also pink and crimson varieties. *Magnolia conspicua* grows to a round tree from twenty to thirty feet high. In May it is covered with large, snow-white, lilylike flowers.

The Mock Orange

The mock orange (*Philadelphus coronarius*) bears pure white, fragrant flowers in dense clusters. It is of vigorous growth and perfectly hardy. It may be grown singly on the lawn or for hedges, and may be trimmed to any desired height.

The Mountain Laurel

The mountain laurel (*Kalmia latifolia*) is a native of the eastern United States and Canada and is one of the most beautiful native plants under cultivation. It is found high up among the New Hampshire mountains and low down in the rocky marshes of Massachusetts, also as far south as Georgia. It is very hardy but grows slowly, reaching a height of from five to ten feet. It prefers a moist place but may be grown almost anywhere if not allowed to become too dry in summer. Plant in the open or among other shrubbery. The blossoms appear in June and July, the flowers varying from pure white to a rich rose. The leaves are broad and glossy, and it is very beautiful for bouquets if cut just before the flowers open.

California Privet

Plant California privet (*Ligustrum ovalifolium*) in October or as soon as the frost is out of the ground in the spring. The planting time may be extended to about the first of May, depending to some extent upon the locality. The privet is hardy in the Northern states south of Boston and Chicago.

Set the plants in single rows one foot apart. Dig a trench a foot deep and a foot wide and place three inches of well-rotted manure in the bottom of it. Fill in with good soil and tramp it down deep enough to

hold the plants so that the crowns will be just below the level of the ground. Spread the roots carefully, fill in soil to near the top of the trench, and tramp it down again. In case the soil is dry, water it when the trench is two thirds full and then continue filling the trench.

FIG. 80. A Lawn inclosed with a California Privet Hedge

The house faces the south. Deutzias are in flower in the foreground. Asters are growing between the deutzias. Roses and other shrubbery are near the building. This is an excellent situation for a good lawn

After planting, the privet should be pruned to within eight or ten inches of the ground. Keep the plants trimmed back to a height of two feet during the growing season. The following spring cut them down to within twelve inches of the ground. During the second

season trim again in the same way, although the hedge may be allowed to grow to a height of three feet if desired.

Always trim the hedge so that the top will have a rounded curve. A round-topped hedge has a neater appearance and will shed snow and ice more easily than one with a flat top.

The Japanese Quince

The Japanese quince (*Cydonia japonica*) produces bright scarlet flowers in early spring. It is suitable for hedges, for borders, or for planting singly on the lawn. *Cydonia japonica* var. *alba* is a form producing showy white flowers. It grows to a height of five or six feet.

Pests. For San José scale, spray with lime-sulfur solution in the autumn or before the buds open in the spring.

The Snowball

The snowball (*Viburnum*), with its flowers growing in large white ball-shaped clusters, is of special value as an individual shrub on the lawn. *Viburnum plicatum* (the Japanese snowball) is one of the most desirable members of this family, being of moderate growth and compact habit. The foliage is a rich green, and the flowers, which appear in May, are larger than the common snowballs. Its leaves, as well as the flowers, are of unusual beauty. It may be grown in masses or as a

FIG. 81. A Lilac Border

Arnold Arboretum, Forest Hills, Massachusetts

single specimen. *Viburnum opulus* (high-bush cranberry) is noted for its bright-scarlet berries, which remain on the bush until late in the winter. It blooms in June. *Viburnum lantana* (wayfaring tree) blooms in May and June. Its fruit changes from red to black in the fall.

The Lilac

The lilac (*Syringa*) is one of the first shrubs to attract our attention in spring. *Syringa vulgaris* (the common lilac) is effective in masses of shrubbery and is often used in making coarse hedges or screens. It blooms in May. To keep the plant low and bushy, it may be pruned immediately after blossoming. *Syringa alba grandiflora* has very large clusters of pure white flowers. *Syringa Charles X* produces magnificent clusters of reddish-purple flowers in great profusion. *Syringa Louis van Houtte* has large clusters of bright-red flowers. *Syringa Marie Legraye* is a dwarf plant with a fine pearl-white bloom. *Syringa President Grévy* is one of the finest varieties. Its flower is clear blue, very large and double. All the varieties named are easily grown as individual plants on the lawn.

CHAPTER XVII

HARDY CLIMBING VINES

The beauty of any home, however attractive, may be enhanced and the house rendered more homelike by vine-covered verandas, porches, porticoes, and arbors. The vines may be set close to the buildings, with low shrubbery or flowers in front of them. All kinds are easily grown and, once planted, require very little attention beyond an occasional soaking with water in very dry weather and a little fertilizer in the spring.

FIG. 82. Boston Ivy

One year's growth. A loose layer of soil is kept around the plant during the summer. The space is covered with leaves or straw during the winter

Before planting, dig down by the side of the foundation to a depth of two or three feet, to make sure that the subsoil is not filled with broken stones or material placed there while the building was in process of construction. Fill the space with good

loam and keep the sod away from the plant, as indicated in Fig. 82. Tulips, pansies, verbenas, or other annuals may be grown in the cultivated space. After the vines are thoroughly established, hardy perennial plants or shrubbery may take the place of the annuals.

Fig. 83. Boston Ivy clinging to a Wall

If supports are needed, iron should be used. Wood frequently rots off about the time the plant has made a good growth. For large plants one-inch iron gas pipe is best, and second-hand pipe may be purchased at a low price. Set this in cement and use screws to fasten the upper end to the building (see Fig. 86). Quarter-inch rods with wire netting may be used for the smaller twining plants.

Fig. 84. Boston Ivy
Entrance of Pierce Hall, Harvard University

The Boston Ivy

The Boston ivy (*Ampelopsis veitchii*) grows rapidly and clings with great tenacity. The leaves so overlap one another as to form a dense sheet of deep green

during the summer. In autumn the color changes to brilliant orange and scarlet. No plant is more useful for covering walls, stone foundations, and exterior chimneys; it is especially valuable for schoolhouses and public buildings. No support is needed; it clings to the bare walls by means of disk tendrils and does not run across door and window openings. If the leaf growth becomes too dense around openings, it may be sheared at intervals during the summer. The plant is entirely hardy when once established, and will winter without protection, but while young it is a little tender and must be protected the first year. It thrives best in rich, sandy loam and will grow equally well in the full glare of the sun and in partial shade.

Fig. 85. Disk Tendril of Boston Ivy

The Virginia Creeper

The Virginia creeper (*Ampelopsis quinquefolia*) has beautiful, five-pointed leaves that turn to rich crimson in autumn. It requires some support when it becomes large and heavy. It is a quick-growing vine, and there is nothing superior as a shade plant for arbors and verandas. It is also particularly well adapted to covering trellises, fences, and old trees; it may be used under trees with dense foliage. Although it will grow in any kind of soil, it does best in a rich loam with an abundance of leaf mold. No protection is needed; it is entirely hardy.

The Clematis

The *Clematis jackmanni* is an excellent vine for porches. It has large, violet-purple flowers and blooms very freely about midsummer. The vines do not grow

Fig. 86. Rambler Rose at the Left; Clematis at the Right
Both plants are supported with iron rods

as luxuriantly as the Virginia creeper or the Boston ivy; they are slender and wiry, requiring some support to twine around, like a rod or a wire (see Fig. 86). The

FIG. 87. *Clematis Jackmanni*

north or east side of a porch is a good location. Although hardy, it is best to mulch it during the winter.

The *Clematis henryi*, a large-flowered variety, pure white, is a free grower and blooms very profusely. *Madame André* bears a large, velvety crimson bloom.

Japanese clematis (*Clematis paniculata*) is a small-flowered, sweet-scented, white variety that grows rapidly, quickly covering trellises, arbors, and fences. It flowers in late summer. The vines will make from fifteen to twenty feet of growth in a single season, and the foliage is especially profuse.

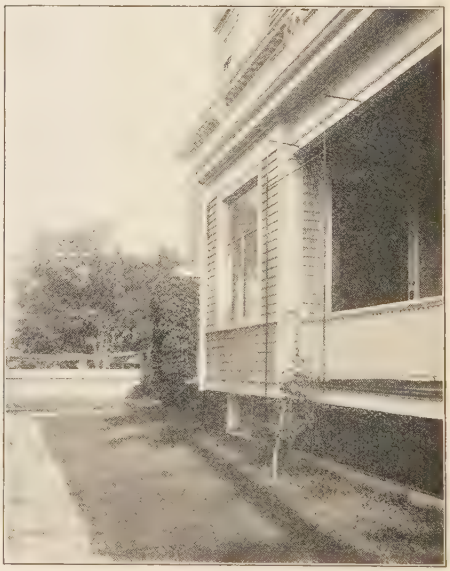


FIG. 88. A Rod Support with Wire Netting

This style of support is suitable for either wistaria or honeysuckle

The Wistaria

The *Wistaria sinensis* is a very large twining plant of rapid growth. Varieties producing blue, white, or lilac flowers may be obtained. It must be given a firm support around which it can twine. The best supports are iron rods that will hold the plant about five or six inches away from porches or buildings. Wistarias thrive best in a sandy loam, but will do well in almost any good soil.

Fig. 89. Honeysuckle

Fig. 90. Aërial Roots by Means of which the Trumpet Vine clings to Walls

The Japanese Honeysuckle

Japanese honeysuckle (*Lonicera japonica*) can be grown under almost any conditions. It may be trained on wire netting or it may be used for a covering on dry embankments where it is difficult to obtain a stand of grass. The branches produce suckers which take root in the soil. After it becomes established, it will grow luxuriantly in full sunshine.

The Trumpet Vine

The trumpet vine (*Bignonia radicans*) has trumpet-shaped flowers of a deep orange-red color, that are formed in large clusters and make a very pleasing contrast to

Fig. 91. Flower of the Trumpet Vine

the dark-green foliage. It is well adapted to stone walls, fences, rockwork, or to any place where a showy flowering vine is desired. It should be given a rod support if grown on the side of a frame building. A luxuriant growth may be obtained by giving the plant some shade and any kind of rich soil.

CHAPTER XVIII

ROSES

Planting. Rosebushes should be planted in well-drained, sunny places. The soil should be spaded to a depth of at least twelve inches and well fertilized with barnyard manure. The bushes should be set deep, and the earth must be well packed around the roots. The shoots should be cut back to five or six buds. After planting, water freely, and if the sun is strong, protect them for a few days with a covering of newspapers or other suitable material. Water every evening until they show signs of having become established, also during protracted drouths.

Pruning. *Rosa rugosa* requires very little pruning. The tips may be shortened annually, so that the canes will have a uniform height. The older canes should be cut out occasionally, so that new growth from the center will be encouraged. All dead wood must be removed, and if the plant is in very bad condition it may be cut to the ground and given an opportunity to make an entirely new growth. The condition of the soil must be carefully looked after if this should be necessary.

Perpetual roses must be cut back liberally in the spring but never in summer or autumn. From two thirds to four fifths of the last year's wood must be removed.

This will make strong flowers that may be increased in size if some of the buds are removed. Numerous small flowers may be produced by cutting away less wood. During the summer the flower shoots should be cut out with a sharp knife after the blossoms fade. Never break

Fig. 92. A Rose Garden

Climbing roses in the center and on the border. The supports are made of iron rods set in cement

off flower stalks. Sprouts that sometimes make their appearance must also be removed during the summer.

Climbing roses should have about one fourth of the previous season's growth cut off in the spring, when the wood is dormant. Old, weak wood must be removed in well-established plants. If a part of the trellis is laid

bare, thrifty branches may be trained over it. Old flower stalks and objectionable shoots should be removed during the summer.

Cultivation. Keep the soil loose under the bushes. A single plant in a lawn should have a circle at least two feet in diameter that is not encroached upon by grass. Give the soil a mulch of lawn clippings occasionally during dry weather in the summer and a heavy coating of coarse manure in the winter.

Diseases. For leaf blight, rust, and mildew, spray with Bordeaux mixture or use dry Bordeaux.

Pests. For plant lice, red spiders, and rose hoppers, spray with sulpho-tobacco soap or kerosene emulsion.

Propagating by cuttings. December or January is the most favorable time for selecting and preparing rose cuttings; then the wood is in a dormant condition, with an abundance of food stored up for starting the buds. The rambler rose is well adapted to schoolroom work.

From a thrifty rosebush take branches grown during the previous summer. Discard all weak and immature tips and make cuttings that are five or six inches in length. Such cuttings usually have four or five buds. Examine the upper bud carefully; it should be strong and in good condition. Both lower and upper ends should be near a bud. Make the cut for the upper end by holding the branch in the left hand and starting the blade of a sharp knife on the opposite side of the stem from the bud, even with the top of the bud, so that the

slant of the cut will be away from it. This will bring the cut near the bud, so there will be little danger of decaying wood. If the cut is made below the level of the top of the bud, there is danger of injuring the delicate connection of the bud with the stem. Make the cut for the lower end so that it will begin just below the bud but on the opposite side of the branch. The slant should be away from the bud. This may be done by first removing the cutting from the branch with a cut some distance below the bud, and then making the cut near the bud with a downward motion.

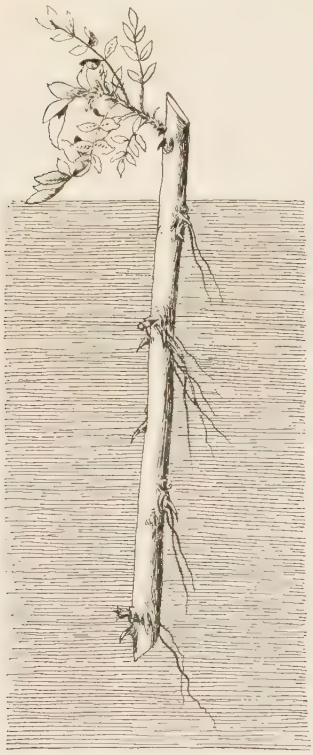


Fig. 93. A Winter Rose Cutting
Two months after planting

Tie the cuttings in bundles of twenty-five or more, with the tops together, and place them, with the bottom end up, in a pit six or eight inches deep; pack leaves around them and mark one edge of the pit with a lath that will reach to the top of the ground, so that the cuttings may be located later without injury to the buds. The cuttings may also be kept in a cool, moist cellar.

In the spring these bundles should be taken up, and the cuttings planted about three inches apart in trenches in good garden soil, with one or two buds above the surface of the ground. Pack the soil carefully around the cuttings, and keep the surface layer of earth loose during the summer. Water them when the ground becomes dry. By the next fall or spring they will be ready for permanent planting. When starting roses in July or August, make cuttings as indicated in Fig. 94; plant them in good soil and keep them in the sun until the cuttings have formed roots (see Fig. 95). The pot or box must have under it a pan containing at least an inch of water.

Fig. 94. A Summer Rose Cutting

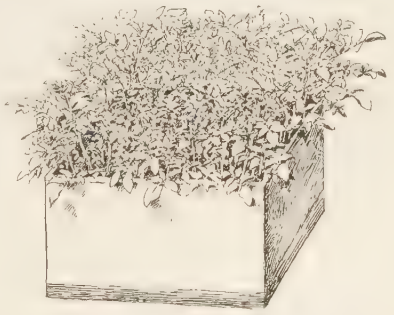


Fig. 95. A Box of Rose Cuttings started in July

The water can be kept at a permanent depth by using a pan that is two or three times as large as the bottom of the box. During hot days add water each morning and evening.

Varieties

Rosa rugosa rubra. *Rosa rugosa rubra* is an excellent rose for planting in the angles formed by barberry bushes in corners. It has large single blossoms of light red that

Fig. 96. A *Rosa Rugosa* Hedge Fourteen Years Old, in Cambridge, Massachusetts

make their appearance in June. The foliage is dark green, and the large scarlet fruit will remain on the bush during the winter. It is extremely hardy and will stand the same treatment as the Japanese barberry. The tops should be kept trimmed to the height of the barberry bushes, and dead wood should be removed. For a white variety *Rosa rugosa alba* may be used.

Perpetual roses. Roses that bloom before school closes in the summer and then show a luxuriant growth of foliage and buds are most desirable for the school-yard lawn, but perpetual roses are usually more satisfactory for the home lawn, as they bloom continuously throughout the summer.

The following varieties are all hardy ; they will endure the winter without any extra protection.

The Frau Karl Druschki, sometimes known as the white American Beauty, is one of the best varieties. Its pure white blossoms make it very desirable.

The Burbank has a large flower of a soft cherry-red color. The blossoms are borne in profusion and have good lasting qualities.

The Helen Gould is a beautifully shaded dark-carmine rose. It has a double flower and is considered one of the best ever-blooming roses.

The Eugene Furst has large crimson, velvety flowers with shadings of black-red. It is very fragrant.

On account of the deep, rich crimson flowers the General Jacqueminot is a great favorite. The flowers are beautiful both in bud and in blossom. It is one of the hardiest perpetual roses.

The flowers of the Gruss an Teplitz are large and handsome, very fragrant, moderately double, of splendid substance, and are produced throughout almost the entire growing season. The color is fiery crimson shaded with a dark, velvety sheen. The bush is hardy and a sturdy grower, often attaining a height of four or five feet.

The Paul Neyron is a large red rose. It is the largest and most showy rose in cultivation. If given good care, it will make straight shoots four or five feet in length in one season, each tipped with a handsome flower that is often four inches in diameter. The blossoms are double and full, finely scented, and are produced all summer.

The Crimson Rambler. The Crimson Rambler is the best rose for covering walls, pillars, trellises, and porches. In July and August a thrifty plant that has been well cared for will have an almost solid wall of crimson flowers.

Wild roses. Wild roses are sometimes useful for planting in a sunny corner. They bloom early, the foliage makes a beautiful bank of green, and the bright twigs and buds give the spot an artistic appearance during the winter. Native varieties may be found in fields near fences or in places where timber has been recently cut. They will thrive best if they are planted in their favorite timber soil, which is a black loam. Varieties may be purchased from dealers under the names *Rosa blanda*, *Carolina*, *lucida*, and *nitida*.

Remove all old wood each spring, but do not cut the plants back decidedly. They are accustomed to doing their own pruning. If the bushes become too thick, they must be taken up and reset.

CHAPTER XIX

SHADE TREES

Under favorable conditions the following trees, if planted when they are three inches in diameter, will make the indicated growth in twenty years:

	Inches		Inches
Silver, or white, maple	21	Hard, rock, or sugar, maple	13
American white elm	19	Red oak	13
Basswood	17	Scarlet oak	13
Red, or swamp, maple	16	White ash	12
Yellow, or common, locust	14	Hackberry	10

Fig. 97. An Excavation which is being filled with Soil for a Red-Oak Tree in the Harvard University Yard

All of the above are satisfactory for street or yard shade, where large trees are needed, although some of the quick-growing varieties are more easily broken by strong winds and are also more likely to be injured by insects. The hard maple and the oaks make better trees and are not injured severely by insects. Give them their native soil as nearly as possible.

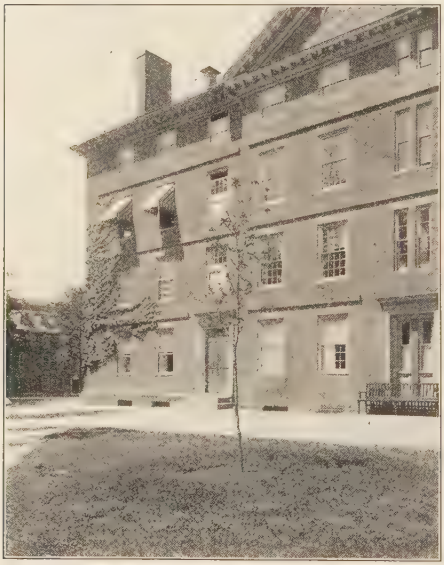


FIG. 98. A Red-Oak Tree in the Harvard University Yard

Three months after planting

The large elms that have stood in the Harvard University campus for a century or more have nearly all been destroyed by insect pests. Some young elm trees have been set out temporarily. Elms thrive in ordinary soil composed of sand and gravel. For permanent trees the slower-growing red oaks are being planted. To prepare the soil for these, the sand and gravel is dug out, leaving a hole five feet deep and twenty feet in diameter. The excavation is filled with woodland soil and left to settle all winter; the following spring, while the wood is in a dormant condition, the trees are planted.

Collection of native wood specimens. A collection of native wood specimens that may be used as an aid in learning the names of trees and the structure of the wood may be made and mounted so that it will be ready for use at any time (see Fig. 99). Gather sticks that are ten or twelve inches long and about two inches in diameter. After they are well seasoned, cut out sections six inches long and saw them lengthwise through the center. In cutting the green wood it is necessary to allow this extra length, as the pieces will "check," or crack, in the process of drying, and the cracked ends must be cut off, to obtain an even surface. Make the cut surfaces smooth with sandpaper and give them a coat of shellac and a coat of varnish. The name of the variety may be placed on the lower end of the section.

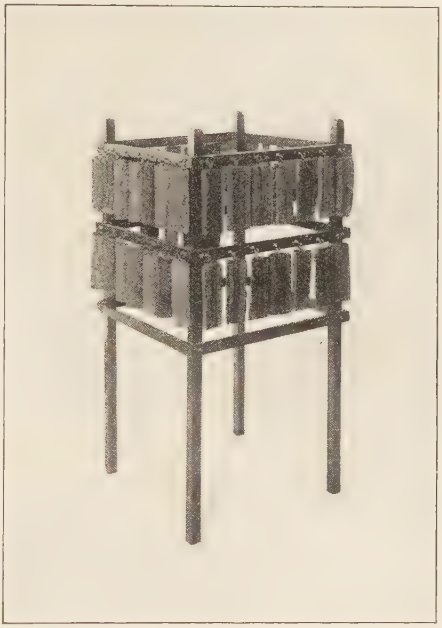


FIG. 99. A Collection of Wood Sections made by Sixth-Grade Pupils in Ipava, Illinois

Pests. To hold in check the elm-leaf beetle, spray with arsenate of lead when the larvæ first make their

appearance. Use five pounds of arsenate of lead to fifty gallons of water. The spray should reach the underside of the leaves. The larvæ may be trapped in strips of gunny sack tacked around the tree, as indicated in Fig. 100. Remove them from the folds of the strip every day. The brown-tail moth, the gypsy moth, the cankerworm, and the tent caterpillar may also be held in check to some extent with the gunny sack, or they may be controlled by spraying with arsenate of lead. Brown-tail nests which may be found at the tips of twigs during the winter should be cut off and burned. Gypsy-moth nests may be destroyed by soaking them with creosote oil.

Fig. 100. A Double Strip of Gunny Sack tacked around an Elm Tree to trap the Larvæ of the Elm-Leaf Beetle

CHAPTER XX

FRUIT TREES

The arrangement of the fruit garden depends entirely upon the amount, the quality, the shape, and the nature of the land that may be given to it. The front of the yard should usually be kept open and free for lawn and ornamental plants, while space for fruit trees may be taken along the sides or in the rear of the yard.

Cherry trees, being symmetrical in form and somewhat attractive during the greater part of the year, especially while in flower and fruit, may be planted in a conspicuous place. Peach trees like the sun. They may be planted between apple trees, and removed when these need all the ground. Apple trees should be kept to the north, so as not to give too much shade to other plants, though a large tree giving shade near the rear of the house is not out of place. Plum trees may be planted at random near walks in the back yard, or they may be planted in hen yards, where they will make an unusually strong growth.

Where the orchard and garden are exposed to severe winds, a row of Norway spruce, arbor vitæ, red cedar, or Austrian pine will give the needed protection and help make the grounds attractive.

Grafting

Grafting wax. Use resin, four parts; beeswax, two parts; tallow, one part by weight. Break up the resin and beeswax and melt them with the tallow. When thoroughly melted, pour the liquid into a vessel of cold water. As soon as it becomes hard enough to handle, take it out and work it until it becomes tough. To keep the wax from sticking while working it, grease the hands with tallow.

Fig. 101. Whip, or Tongue, Grafting

a, stock; *b*, scion; *c*, stock and scion united

Waxed string may be prepared by putting a ball of No. 18 knitting cotton into a kettle of melted grafting wax. In five minutes it will be thoroughly saturated with the wax and ready for use at any time.

Whip grafting. A *scion* is a portion cut from one plant to be inserted upon another. It should be of the previous season's growth. The *stock* is the portion of the plant upon which the scion is to be placed. One-year seedlings may be used for this purpose. They should be taken up in the fall and wrapped in damp moss and stored in a cool cellar. Make the graft by cutting the stock with one smooth diagonal cut about three fourths of an inch in length. Place the knife about one third of the distance from the end of the cut surface

and split the stock. Cut the lower end of the scion in the same way. Fit the two portions into each other so that the cambium layers meet. After fitting the parts together, bind them with five or six turns of cotton yarn coated with grafting wax. Then smear wax over the entire joint to make it air-tight.

After the process of grafting is completed, plant the trees in boxes or flowerpots in moist sand, and store

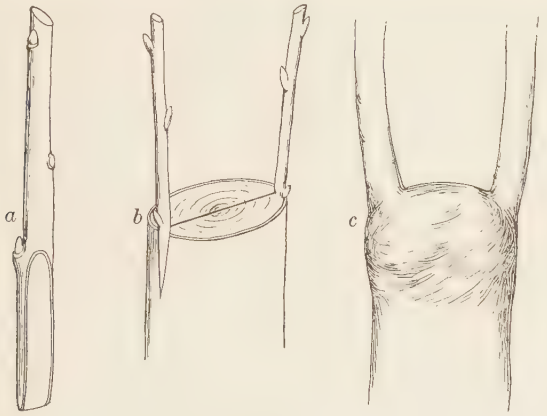


Fig. 102. Cleft Grafting

a, scion; *b*, two scions placed in a stock; *c*, same after two years' growth

them in a cool cellar until spring, when they may be taken up and planted in rich garden soil. The work of grafting should be done in February.

Cleft grafting. This form of grafting is sometimes used in placing new branches on old apple trees. Several different kinds of apples may be grown on the same tree.

Select branches from one to two inches in diameter. Cut them off with a saw, without loosening the bark

from the stub. Split the end with a broad chisel or grafting tool. Spread the cleft with a wedge so that the scion may be inserted. Cut the scion in the shape of a rather long wedge. The lowest bud on the scion should be near the top of the stock. Place the scion so that the inner layer of the bark will meet the inner layer of bark of the stock. It is well to make the wedge-shaped part of the scion a little thicker along one edge than along the other, and to set it so that the thicker edge is the one whose bark meets the bark of the stock. Carefully cover all cut surfaces and every part of the cleft with grafting wax.

Apples

Study the kinds of apples produced in your locality. If you can have but few trees, select enough of different varieties to give a succession during the summer. In selecting winter apples, choose some for early use and other varieties for late spring use. If your place is large enough to plant for market, choose standard varieties that do well in your particular kind of soil and climate.

Cultivation. Cultivate the soil regularly during the spring and summer. Garden crops or small fruits may be grown between the trees for two or three years. In July or August sow a cover crop on the ground. Clover, cowpeas, and vetch are preferable, because they take free nitrogen from the air and add it to the soil. Rye and oats are also valuable, since they take up nitrogen that is in the soil and keep it until the next season.

Fertilization. Use stable manure to keep the orchard in good bearing condition. Plow it into the soil, or if blue grass is growing under the trees, as it sometimes does in old orchards, apply a liberal top-dressing of manure at least once a year. An annual dressing with a

Fig. 103. Chickens in the Orchard

commercial fertilizer will be beneficial to any orchard. Chickens running at large under the trees will fertilize the soil and keep insect pests in check.

Pruning. Immediately after planting, cut off all shoots except from three to five branches, which are left to form an evenly balanced head. Also rub off all shoots that come out below the branches, and pinch back those

branches that grow unevenly during the summer. For the first three or four years, cut back from a half to a third of each season's growth. Prune every year during the latter part of the winter or in early spring. Remove all dead wood, or thin the branches if they become crowded. All large branches must be cut close to the main stem, so that the wound will grow over and not make a hole in the tree, as it so often does when long stubs are left. Paint the cut surface.

Spraying. For the disease known as apple scab, spray with the 5–5–50 formula of Bordeaux mixture. Give three sprayings — just before the petals open, just after they fall, and from ten days to two weeks later. For San José scale, spray with lime-sulfur late in the winter or early in the spring. For the coddling moth, spray with arsenate of lead or Paris green just before the petals open, just after they fall, and two weeks later. Never spray while the trees are in full bloom; it will destroy some of the fruit and kill the bees that visit the blossoms. Where it is necessary to spray for scab, the arsenate of lead or Paris green and the Bordeaux mixture may be applied at the same time.

If the trunk of the tree is infested with borers, which may be detected by a small amount of sawdust where they enter, or by the withered appearance of the bark, dig for them with a wire or a pocketknife.

Gather all nests of brown-tail moths, gypsy moths, or tent caterpillars during the winter. If any are seen in the spring, burn them with a kerosene torch.

The railroad worm, the small white maggot that eats winding channels all through the Porter apple, can be held in check only by picking up all fruit that falls; this pest cannot be reached by spraying. If the apples are permitted to remain on the ground, the maggots will crawl into the ground and change to pupæ; the following season they will produce flies that will lay their eggs beneath the skin of the young apples.

Pears

Varieties should be selected that will ripen from August until late in the fall. The pear does best on a loose, strong, clayey soil. A dressing of coarse manure is beneficial when the tree is planted. Wood ashes may be applied in the spring. Too much fertilizer has a tendency to produce pear blight. Give the soil thorough cultivation after the trees are set out. Pick pears just before the fruit is ripe. Plant and prune like apple trees.

If pear blight appears, cut off the affected branches and burn them. The treatment for pear scab is the same as for apple scab.

Peaches

Set out yearling trees and trim off all the branches, leaving them in the form of switches. Rub off all buds during the summer except such as are needed to form a well-balanced head. Set trees ten or twelve feet apart in rows twenty feet apart. Plant new ones at intervals; the old ones need to be taken out about once in ten

years. Fork wood ashes, barnyard manure, potash, or bone meal into the soil around the trees early in the spring. Keep the ground cultivated and prune in March. If borers are in the stem, dig for them. For brown rot apply copper sulfate before the buds swell, and after the blossoms fall away apply peach Bordeaux mixture. For curled leaf use Bordeaux mixture before the blossoms open and after they fall. For curculio jar the tree and catch the beetles on a sheet. For San José scale spray with lime-sulfur early in the spring.

Plums

Plum trees may be planted to advantage in henyards. Set out three-year old trees, ten feet apart. They will thrive in any properly fertilized soil.

Spray with Bordeaux mixture, lime-sulfur, and lead arsenate when other fruit trees are sprayed. Shake off curculios and destroy them.

Quince

The quince should have a rich, deep, and moist but well-drained soil. It has a dwarf growth. Plant eight or ten feet apart; keep all suckers pinched off and the top open to admit air and sunshine. If the tree is not controlled, it will develop into a bush.

Cut off branches affected with blight and burn them. Use Bordeaux mixture for leaf blight.

Cherries

There are early and late varieties of this fruit. In selecting trees try to obtain a succession. There are also sweet and sour cherries. The sweet kinds will develop into large trees and the sour will remain low-growing. Cherries will thrive on almost any kind of good soil, but it must be kept well cultivated while the trees are young.

For aphis, use kerosene emulsion, quite strong, repeating every three or four days. For slugs, apply hellebore and arsenate of lead. The sour kinds of cherries are less subject to attacks from fruit enemies than the sweet ones. If black knot appears, cut out and burn the affected parts to keep the disease from spreading.

CHAPTER XXI

SMALL FRUITS

Small fruits need a deep, rich, strong, loamy soil, which should be prepared as for garden crops and kept well cultivated all summer. In autumn, mulch the land with barnyard manure and spade the fine material into the soil in the spring. Low vegetables, such as lettuce and radishes, may be grown between the rows the first summer.

Blackberries

Set the plants two feet apart in rows that are six feet apart. Cultivate until midsummer each year. Remove all new shoots not needed to fill out the row. Take out all old wood late in the fall or before growth begins in the spring. Cut off the ends of canes so that they will be four or five feet high.

Blackberries may be given a mulch of coarse manure, leaf mold, or straw between the rows in the fall. If much material remains in the spring, rake off the coarsest.

New plants may be obtained by transplanting the suckers that come up from the roots. Blackberries will grow in partly shaded spots.

Diseases. If orange rust makes its appearance, cut out the infected canes and burn them.

Raspberries

Plant raspberries and care for them the same as blackberries, excepting that the old canes should be cut out as soon as the fruit is ripe and the leaves drop, so that all nourishment may be taken up by next year's growth. The patch should be renewed every five or six years. The young shoots coming up from the roots may be transplanted.

Currants and Gooseberries

Set the plants three feet apart in rows five feet apart. Careful cultivation will increase the yield as well as the quality of the fruit. Manure liberally. When the season becomes hot and dry, mulch with coarse manure between the rows. Keep all dead wood cut out. If the canes become too numerous, remove some of the weaker ones. Transplant new shoots that grow up from the roots.

Pests. For the currant worm, spray with Paris green or lead arsenate before the plant blooms. If a second brood appears, spray with white hellebore.

Grapes

Grapes will thrive on any kind of soil and in almost any location with very little attention, although the best results will be obtained by careful cultivation and by dressing the soil each year with barnyard manure, commercial fertilizer, or bone meal. Spade the fertilizer

into the soil early in the spring, and in autumn give it a mulch of coarse manure. If the leaves become too dense during the summer, remove some of them, and pinch off the ends of vines to admit sunshine to the fruit.

Fig. 104. Grapevines forming a Screen for a Back Yard

Pruning. Cut back the plants to three or four buds before planting. The next spring, before the sap begins to run, remove all but one stem and cut it back liberally. The second spring after planting, cut away all but two branches of the main stem, which will serve as the parent vines, from which laterals will grow and bear fruit. The grapes are always borne on new shoots. If the two branches should be very long, cut them back. The third

spring cut away all but three or four of the shoots nearest the main stem, and cut them back to eight or ten buds. Continue thinning out vines each year.

Supports. The vines may be supported by tying them to posts or wires, or if the side of a building is to be covered, make loops for the vines out of strips of leather and nail to the building.

Reproduction. Grapes may be reproduced by means of hardwood cuttings, in the same way that roses are reproduced (see p. 172), or by means of layers. Layers are made by placing a vine on the ground and covering it with soil at intervals. Roots will be put forth and branches thrown up. Later the vine may be cut between these buried places. This can be done at any time in the spring or early summer. Plants will be ready to set out late in autumn or early the next spring.

Diseases. For black rot, anthracnose, and downy mildew, clean up and burn all dead branches and leaves in early spring. When the buds are swelling, spray with Bordeaux mixture so as to cover all the wood posts and trellises, as well as the vines. Ten or twelve days later give a second treatment. A third treatment should be given when the fruit has set. Two or three other sprayings may be given if necessary. After the fruit is set, the ammoniacal copper carbonate solution may be used instead of the Bordeaux mixture to avoid discoloration. For leaf blight, spray with Bordeaux mixture every two weeks after the crop is harvested; it may be necessary to use three or four applications. Powdery mildew

(common on the Pacific coast and on vines grown under glass) may be controlled with flowers of sulfur.

Fig. 105. A Bunch of Grapes in a Paper Bag

Pests. If the young leaves and vines become infested with plant lice, use kerosene emulsion or a strong solution of tobacco soap.

An excellent way to protect fruit against both disease and insect pests is to fasten paper bags around the bunches when the grapes are about half grown. The fruit will mature more evenly and it may remain on the vines longer.

Strawberries

Strawberries may be grown in any good garden soil that is light and fertile. The plants may be set out in midsummer, fall, or spring. Strong ones transplanted in July or August will give a full crop of fruit the next season. They may succeed potatoes, onions, or any of the early vegetables.

Some varieties of strawberries bear both stamens and pistils and are known as "perfect flowering plants," while others bear pistils only and are known as "pistillate plants." The pistillate forms must have perfect flowering plants growing every eight or ten feet in the row, to pollenize their blossoms.

Beds planted in midsummer should usually be renewed after the second bearing season, or the matted rows may be spaded under, so that new rows will be formed by the runners in the spaces between the old

Fig. 106. A Strawberry Plant sending out a Runner

a, old plant; *b*, runner; *c*, new plant

rows. The next year the plants will be cultivated where the old ones have been removed.

Set the plants one foot apart in rows three feet apart. When setting them out, spread the roots carefully and press the soil tightly about them. Water before entirely

filling the hole and then place a loose layer of soil around them. Keep the loose layer of soil on the bed during the entire season. If the season is dry, water the plants each evening until they become established.

In the fall, cover with a mulch of old manure that is free from weed seed. The coarse material may be raked between the rows the next spring and the fine material spaded into the soil between the plants.

Diseases. Spray with Bordeaux mixture for mildew, leaf blight, or rust.

CHAPTER XXII

THE VEGETABLE GARDEN

Tools

The spading fork. The wide-tined spading fork is one of our most useful garden tools. It is used for spading the land and breaking the large clods; it will also take the place of the regular manure fork in a small garden. Crops that grow under the ground are harvested with the spading fork. On account of the use made of it in digging potatoes, it is sometimes called the potato fork.

The rake. A good steel rake is of much importance in the garden. The soil may be pulverized with it after spading, and by raking the garden after a rain a surface mulch may be made that will hold the moisture in the soil.

The hoe. There are various types of hoe, each of which has its special use, but the common one will answer practically all purposes. It is used in making drills for beans and other large seeds, in mixing the soil in hills, in cutting weeds, and in cultivating the soil where the wheel hoe is not used.

The trowel. A trowel with a curved steel blade about five inches long is valuable for making drills for fine seeds and for transplanting cabbages, tomatoes, and other large plants.

The weeder. A hand weeder may be used for loosening the soil and destroying weeds between onions, carrots, beets, and other small crops.

The watering pot. A two-gallon watering pot with a medium fine rose will serve to water small plants as they

Fig. 107. Making the Soil Fine with a Wheel Hoe

are set out. It may also be used for spraying potato vines and other plants with Paris green or arsenate of lead.

The garden line. Make a garden line by fastening a stake on each end of a heavy twine that will reach the full length of the garden. Pieces of boards one by two inches, thirty inches in length, sharpened on one end, will serve as stakes. If foot and half-foot measures are

marked off on these, no other measure will be needed for finding out how far apart the rows are to be.

The wheel hoe. One of the most convenient tools is the wheel hoe. A single implement costing from three to four dollars will answer the purpose, although better work can be done with one of the more expensive kinds.

The one shown in Fig. 107 may be used in any garden where the rows are a foot apart. It will save time even if the rows are no longer than ten feet. With rows thirty inches apart it may either straddle the rows or run between them. Where the rows are closer together, it may be used with one wheel. Under favorable conditions it can be pushed straight ahead, but better results may be obtained by using it with successive strokes, varying the length to suit the nature of soil and crop.

Fertilizers

Nitrate of soda. At the rate of two hundred pounds per acre nitrate of soda may usually be applied to gardens with profit. Scatter the nitrate broadcast on the land at the time of planting and cultivate immediately afterwards.

Mixed fertilizers. A mixed fertilizer that contains nitrogen, phosphorus, and potash in about the right proportions may be made as follows:

Nitrate of soda	300 lb.
Fine dry loam	200 lb.
Acid phosphate	400 lb.
Sulphate of potash	100 lb.
Total	1000 lb.

Apply this fertilizer at the rate of about one thousand pounds per acre at the time of planting. Later in the season another application may be made between the rows, at the rate of about five hundred pounds per acre.

FIG. 108. Growing Plants in Water

a, Wandering Jew growing in water without fertilizer; *b*, plant growing in water with fertilizer. Use nitrate of soda, three ounces; acid phosphate, four ounces; and sulfate of potash, one ounce in eight gallons of water. To make a smaller amount, pulverize and mix the above amounts, take one eighth of the mixture and put it into one gallon of water

To obtain satisfactory results from the use of commercial fertilizers, the land must be kept in good condition with barnyard manure or with green manure. Land needs humus before it will pay to use commercial fertilizers.

Leaf mold. For making leaf mold use leaves that do not contain garden rubbish, which may be infested with plant diseases or insect pests. Lawn clippings and

manure may be included. Make the heap in a shady place and cover it with manure or soil to keep the leaves from being carried away by the wind.

Rotted sod. Rotted sod may be made at any time of the year. Cut the sod, turn the layers upside down,

FIG. 109. A Tub containing Liquid Manure

and put as many layers in a pile as desired. Sod for growing cucumber and other seedlings in boxes or cold frames should be cut the previous autumn. If cut too long before it is used, the roots will decay, so that the pieces will not hold together. (See Fig. 16.)

Liquid manure. Place in a barrel, tub, or jar a bag containing sheep, cow, or horse manure equal to about

one half of the capacity of the vessel, and fill it nearly full of water. In three or four days a brown liquid will be extracted from the manure. If this is very strong, it should be thinned to a light-brown color before applying it to the roots of plants. The vessel may be refilled several times.

Liquid manure is one of the best fertilizers for house plants, as well as for the garden. Apply the manure every two or three weeks; then water freely, to carry the nourishment to the roots of the plants. Garden plants may be given a very liberal supply by removing the rose of the sprinkler and pouring the liquid around them

How to destroy Insects

Biting insects. Some insects bite or chew the plants on which they feed. These may be killed by spraying poisons on the parts which they eat. Caterpillars have jaws and always chew their food. All beetles and weevils have biting mouth parts.

Sucking insects. Other insects have sucking mouth parts. They thrust their beaks into the tissues of the plants and suck the juice. Such insects cannot be killed with stomach poisons. Instead, a "contact insecticide," something that kills the insect when it comes in contact with it, must be used. Plant lice, scale insects, and bugs must be killed with contact insecticides.

How to prepare Stomach Poisons

Paris green. Use one heaping teaspoonful to three gallons of water. To make larger quantities, use the following formula: Paris green, one pound; lime, two pounds; water, two hundred gallons. Sprinkle the Paris green into the lime gradually while it is being slaked; then add the water. Stir the mixture while using, to keep it from settling to the bottom. For spraying peach trees and other plants with very tender foliage, use two thirds the amount of both Paris green and lime.

Lead arsenate. Use one tablespoonful to one gallon of water, or three pounds to fifty gallons of water. Lead arsenate sticks to the leaves better than Paris green, and there is no danger of burning the foliage with it, but it does not kill the insects so quickly.

Hellebore. Mix one part of powdered hellebore with three parts of flour and keep the mixture in a closed vessel overnight before using, or dissolve a tablespoonful in three gallons of water. For vegetables and fruits that are nearly ripe this is safer than Paris green or lead arsenate.

Poisoned bait. Thoroughly mix a large tablespoonful of Paris green with three quarts of bran. Moisten the mixture with sweetened water or molasses, so that it will stick together. In the evening distribute this in small amounts along the rows that are being injured by cutworms. Care must be taken that the birds which feed on garden insects are not destroyed by its use.

How to prepare Contact Insecticides

Kerosene emulsion. In half a gallon of boiling water dissolve a quarter of a pound of hard soap shaved fine. Remove from the fire and pour in one gallon of kerosene. Shake the mixture vigorously at once or churn it with a spray pump until a creamy emulsion is formed. For summer use add one part to nine parts of soft water, or one to seven for winter use.

Kerosene and milk emulsion. Sour milk, one pint; kerosene oil, one quart. Warm to blood heat and mix thoroughly. Dilute twenty times with water.

Carbolic acid emulsion. To one pound of hard soap dissolved in one gallon of boiling water add one pint of crude carbolic acid and emulsify by shaking vigorously or churning with a spray pump. For cabbage maggots and other root insects use one part emulsion in thirty parts of water.

Whale-oil soap. Dissolve half a pound of whale-oil soap, shaved fine, in one quart of hot water; then add five gallons of cold water and apply it with a garden sprinkler. A thick solution may be smeared on the trunks of trees to keep worms from crawling up.

Soap solution. Dissolve a quarter of a pound of soap in two gallons of water. This may be used for plant lice or for scale on house plants.

Lime-sulfur. Slake twenty pounds of fresh-burned lime; add fifteen pounds of sulfur. Boil in twenty-five gallons of water for one hour. This spray must be used

during the winter or before the buds open in the spring. Its chief use is to destroy scale insects on fruit trees.

Tobacco dust. For aphis and flea beetles, place a small quantity in a coarse cloth and dust it on leaves when they are damp; for insects that injure the roots and stalks, scatter it on the ground around the stems.

Plant Diseases

Fungi. Both the leaves and the fruit of many plants are attacked by fungi, such as mildew, blight, rust, and black rot. The fungi penetrate the interior of the tissues, so that spraying after the parts are infested is of little value.

Bordeaux mixture. Bordeaux mixture may be obtained either in a dry or in a liquid form, ready for use by simply adding water, or it may be prepared by the following formula, which is known as the "standard Bordeaux mixture": Copper sulfate, six pounds; stone lime, four pounds; water, fifty gallons. Place the copper sulfate in a coarse cloth and suspend it in an earthen or wooden vessel containing one gallon of water for each pound of the copper salt. Slake the lime and add one gallon of water for each pound of lime. The stock solutions may be kept separate and mixed as needed. Before mixing add water enough to make twenty-five gallons of each solution. Keep well stirred while mixing. The strong solutions must not be poured together.

The standard Bordeaux mixture may be used successfully on plants whose leaves are not easily injured. It hurts the foliage of peach trees and may also discolor the fruits of apple or pear trees. The strength may be decreased or increased as desired.

The 5–5–50 formula is copper sulfate, five pounds; lime, five pounds; water, fifty gallons. By reducing the quantity of copper sulfate and increasing the lime, the danger of scorching may be lessened.

Peach Bordeaux mixture, or the 3–9–50 formula, is copper sulfate, three pounds; lime, nine pounds; water, fifty pounds. This formula is used extensively for spraying peach trees, and is not likely to injure the foliage.

Bordeaux mixture and insecticide. To fifty gallons of Bordeaux mixture add four ounces of Paris green or three pounds of lead arsenate.

Potassium sulfide. Use one ounce of potassium sulfide in three gallons of water. This does not discolor the leaves. It is especially effective in preventing mildews and rusts.

Sulfur. Flowers of sulfur is used to prevent mildews, such as that of the rose. Dust the powder over the plants when they are damp.

Formalin. Formalin is used very extensively for preventing scab on seed potatoes. Use one ounce of formalin to two gallons of water.

Cold Frames

Cold frames are warmed by the sun; in northern sections plants may be kept growing in them from early March to late October. During the winter they will

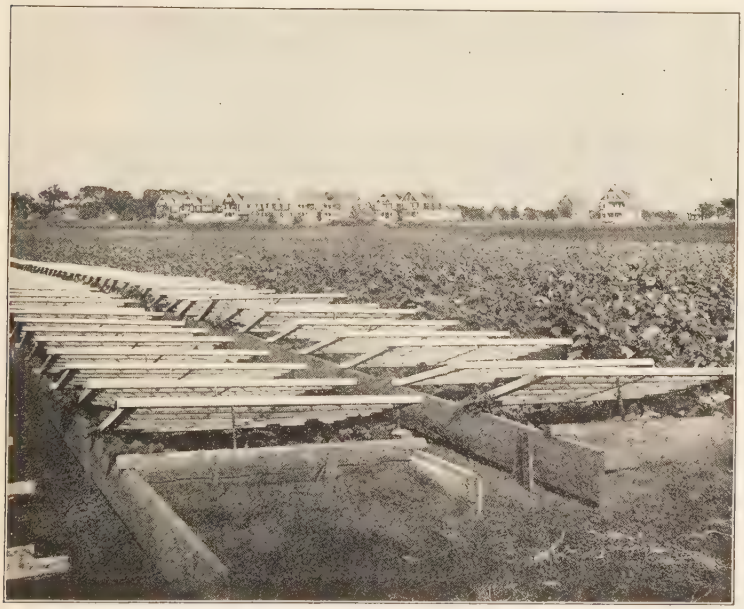


Fig. 110. Growing Cucumbers under Cold Frames
The photograph was taken July 25, at Arlington, Massachusetts

serve as storehouses for bulbs and seedlings that are to make an early start in the spring. In the southern part of the United States they can be used during the winter months for growing vegetables.

Cold frames regulate heat and moisture and protect plants from heavy winds and dashing rains. If they

are kept closed at night, moths which lay eggs that produce cutworms or other destructive larvæ cannot enter.

How to make a cold frame. The size of a cold-frame sash is three by six feet. The length of the cold frame will depend upon the number of sashes to be used. Make a frame that is six feet wide, eight inches high at the front, and twelve inches high at the back. Either one-inch or two-inch lumber should be used.

Fig. 111. A Lean-to Cold Frame

A lean-to cold frame. A lean-to cold frame may be made by nailing a two-inch by four-inch piece of lumber against the south side of a building and then constructing a frame as indicated in Fig. 111. It is better adapted to early spring and late fall use than the more exposed frame. Keep manure or straw packed around it during cold weather. The frame may be covered with mats and boards during the winter and used as a place for storing cabbage, carrots, turnips, and other root crops.

Hotbeds

A temporary hotbed. A temporary hotbed may be made by placing a frame covered with sashes on a heap of manure (which should be from grain-fed horses) mixed with one third leaves or straw bedding. Prepare the manure by stacking it in a compact heap. Turn it over after three or four days and restack; put what was on the outside of the heap on the inside. After three or four days more, mix it carefully and spread it evenly in a heap about fifteen inches deep, eight feet wide, and as long as required for the number of sashes you intend to use. Tramp down hard and set on the frame. After placing, scatter three or four inches of good garden loam over the area inclosed by the frame. Place the sash in position and allow the bed to heat up. Do not plant any seeds in it until the temperature begins to subside, which will be about three days after the sashes are put in place. Plant after the temperature has fallen to 90 degrees.

Permanent hotbeds. For a permanent hotbed where manure is to supply the heat, a pit that is about two and one-half feet in depth is dug. The sides and ends are supported by a lining of plank held up by posts, or by a nine-inch brick wall. The plank frame or the brickwork of the pit should be extended above the surface of the ground eight inches at the front and twenty inches at the back. Prepare the manure as for the temporary hotbed, and tramp it as it is being put into the pit, filling in with six inches of the best garden soil.

Banking. When the weather is cold, bank the frames around the outside with a foot of manure, leaves, or straw. Cover this banking with three or four inches of soil, which serves to keep the litter in place and forms a crust for further defense.

Care of a hotbed. At the North, in addition to the glazed sash, mats of burlap or carpet will be needed on cold nights. During bright days, even when the temperature outside is near the freezing point, it will be necessary to lift the sash a little at the high side of the frame, to allow the hot air to escape and prevent injury to the young plants.

Watering. Hotbeds should be watered in the morning, and then only on bright days. Watering at night causes a loss of the accumulated heat. The water itself lowers the temperature, so that on cold nights the danger from frost is greatly increased. The excessive moisture resulting from watering the leaves and confining them during the night also conduces to the development of mildew and the damping-off fungus.

Pits. Pits are excavations from two to four feet deep, with sides protected by plank or brick walls, upon which a cold frame is placed and covered with sash. They are valuable for storing vegetables, and hardy flowering plants in tubs or urns used about the lawn during the summer. The sides of the frame should be banked with manure covered with three or four inches of soil. During severe weather the pit should be covered with mats or carpet held down by boards.

Germination of Seeds

Parts of seeds. A seed consists of the *embryo* (a miniature plant commonly called the germ) and its coverings.

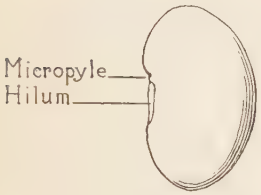


Fig. 112. Lima Bean

The seed coat of the bean is called the *testa*. The little opening in the testa, which may be found by squeezing a seed that has been soaked, is known as the *micropyle*. The place where the seed was attached to the pod is called the *hilum* (see Fig. 112).

The embryo of the bean has three parts: the small stem, or *hypocotyl;* the seed leaves, or *cotyledons;* and the bud, or *plumule*. Food material for the support of the young plant is stored in the cotyledons (see Fig. 113).

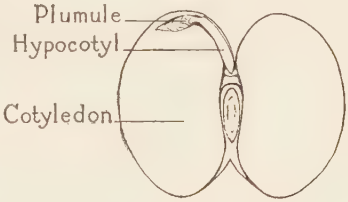


Fig. 113. Lima Bean opened Lengthwise

Fig. 114. A Castor Bean

After cracking the shell-like seed coat of the castor bean we find that the part within is covered with a delicate membrane, the inner seed coat. The food material within this coat contains the very thin cotyledons, that absorb the food stored around them. When the food material is stored on the outside of the cotyledons, as in the castor bean, it is known as *endosperm* (see Fig. 115).

In a grain of corn the lower part of the embryo, located near the hilum, is called the *radicle*. The plumule is the upper part of the embryo, and the single cotyledon lies next to the endosperm, which constitutes a large part of the grain of corn (see Fig. 116).

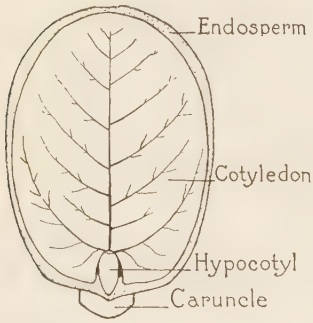


Fig. 115. Castor Bean with One Half of the Endosperm and One Cotyledon cut away

Soak beans, castor beans, corn, and several other kinds of seeds. Examine the seed coats and compare them. Find the embryo in each. If the seeds contain endosperm, locate it with reference to the cotyledons.

Kinds of seeds. As the seeds mature during summer and fall, the names of the different kinds of seeds may be learned while gathering samples. Place the seeds in envelopes and write the name of each kind on the envelope that contains it. Envelopes that have been used will do; they may be closed by folding over the open ends.

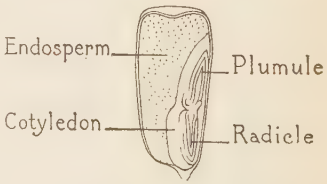


Fig. 116. A Grain of Corn cut Lengthwise

Seed board. A convenient device for learning the names of seeds is a seed board, shown in Fig. 117.

The dimensions of the board may vary. Make the holes one inch in diameter, half an inch deep, and half

an inch apart. If the holes are placed half an inch apart, they may be one inch from the sides and ends. This will give a board of the above dimensions a neat appearance. On each side of the board, nail a strip of heavy tin or galvanized iron that has been bent to form a groove in which to slide a pane of glass to cover the surface of the board.

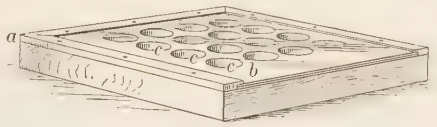


FIG. 117. A Seed Board

a, grooved strips for holding glass; *b*, glass cover; *c*, holes half an inch deep for holding the seeds

Resting period of seeds. Seeds usually require a season of rest before they germinate. The seeds of most of our common field and garden plants will begin growth soon after they mature, but germination of the seeds of many of our native plants seldom takes place before the second spring or summer. Some seeds will remain in the ground for several years before they germinate. It may be necessary for the seed coat to decay or for the hard covering to be opened by the frost.

Vitality of seeds. Seeds gradually lose their vitality. Onion seeds are of little value after the second year. Cucumber seeds, if kept dry and in good condition, will retain their vitality for ten years.

Testing seeds. Seeds that were not mature when gathered, those that are too old, and such as have not been kept under proper conditions, may not germinate at all or may produce weak seedlings. When the quality of seeds is suspected, they should be tested.

In a large dinner plate with a smooth, round edge place about half an inch of moist soil. Place two layers of cheesecloth, cut in the form of a circle, so that they will cover the soil but will not reach over the edge of the plate. Slowly sprinkle water on the cloths until they are uniformly moist, and on them place the seeds to be tested. Cover the seeds with a plate.

If one hundred seeds are placed in the germinator, the percentage of good ones may be easily calculated. In selecting seeds care must be taken to obtain a fair sample. If the seeds are in bags or boxes, the light ones may be on top. Take some from every part of the box. In the case of corn on cobs, make a selection of twenty ears from different parts of the bin, then take five grains from different parts of each ear.

If a glass bell jar can be obtained, it may take the place of the upper plate when the seedlings have begun to grow. The vigor of the seeds, as well as their sprouting quality, may then be observed.

Conditions of germination of seeds. In order that the young plant may utilize the food stored in the seed until it establishes itself in the soil, it must be provided with the necessary conditions of *warmth*, *air*, and *moisture*.

Warmth. The degree of warmth varies with the plant. Some seeds will germinate when the temperature is very near freezing, while others require considerable heat. Although growth may begin at a lower temperature, there is a certain degree of warmth, called the optimum temperature, at which the best results may be

obtained with each variety. The optimum temperature for germination of cabbage and lettuce is 55 degrees. During the day the temperature may be 70 degrees, that of the ordinary room, and at night it may go as low as 45 degrees. The optimum temperature for the germination of tomato and pepper plants is 75 degrees. This may go as low as 60 or as high as 90 degrees.

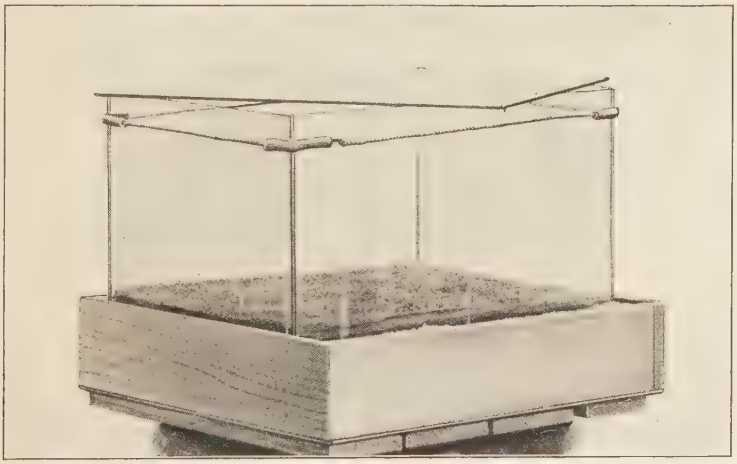


Fig. 118. A Seed Germinator

Air and moisture. Soil that is in good condition for germinating seeds contains about one sixth air and one sixth water. The composition of soil should be such that it will retain the necessary amount of moisture, but it must be well drained; otherwise the spaces between the small particles of which the soil is composed will be filled with water, and so prevent a sufficient supply of air from reaching the seeds and roots.

The conditions for germinating seeds will be more uniform if the seed boxes are placed in a glass case. If this cannot be easily obtained, a glass box made of windowpanes may be constructed over the seed bed after the seeds are planted. Push the glass into the soil to a depth of two or three inches and tie the panes with

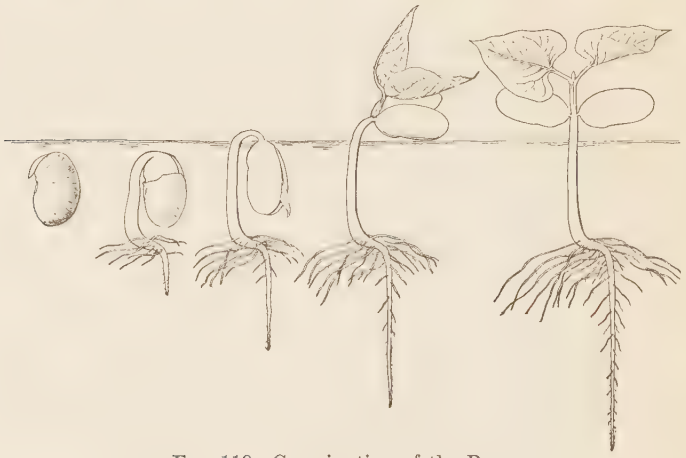


Fig. 119. Germination of the Bean

wire (see Fig. 118). The cover should be a size larger than the side pieces. In case the soil becomes too moist, leave an opening for ventilation.

Germination of the bean. When a bean seed is planted, it will absorb water through the micropyle. The water, with the aid of heat and air, will prepare the food material that is stored in the cotyledons so that it may be made use of by the growing plant. As the hypocotyl and plumule begin to grow, the testa bursts and remains in the ground. A root then develops from the lower end

of the hypocotyl. A short distance back from the tip of the root, small, velvety-looking hairs make their appearance. The root hairs take up water containing nourishment from the soil. The hypocotyl lengthens to near the surface of the soil, where it forms a loop that breaks the soil and lifts the cotyledons into the air. The seed

Fig. 120. Germination of the Castor Bean

leaves continue to give up their food to the young plant for some time after they have been raised from the soil.

Plant several rows of beans in a box. Beginning the third day, take up one row each day for five days in succession and study the development of the seedlings. Leave the last row until after the cotyledons drop off.

Germination of the castor bean. The castor bean has a spongy portion, called the *caruncle*, which absorbs the water taken in by the micropyle. The nourishment stored up in the oily endosperm is absorbed by the thin

cotyledons, which contain veins. When the castor bean germinates, the hypocotyl forms a loop that pulls up the cotyledons inclosed by the endosperm. The hard testa gradually slips off, and the endosperm is absorbed until nothing but a thin film remains. The cotyledons grow to form green leaves, which serve the plant as foliage for some time.

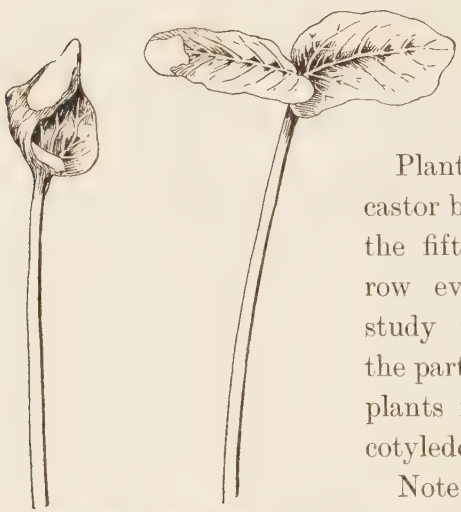


Fig. 121. The Castor-Bean Plant
At the left the cotyledons are held together by the endosperm

Plant several rows of castor beans in a box. After the fifth day, take up one row every third day and study the development of the parts. Leave some of the plants in the box until the cotyledons drop off.

Note that the plumule does not develop so rapidly in the castor bean as in the bean and that the cotyledons grow until they become of considerable size, while those of the bean soon shrivel up and drop off.

Germination of a grain of corn. When a grain of corn germinates, the primary root, or the radicle, grows toward the narrow end of the grain and breaks out of its sheath near the hilum; the plumule makes its appearance at the opposite end. The young plant obtains some food from the cotyledon, but the greater part of

its nourishment is absorbed by the cotyledon from the endosperm. The cotyledon and endosperm remain in the ground during germination.

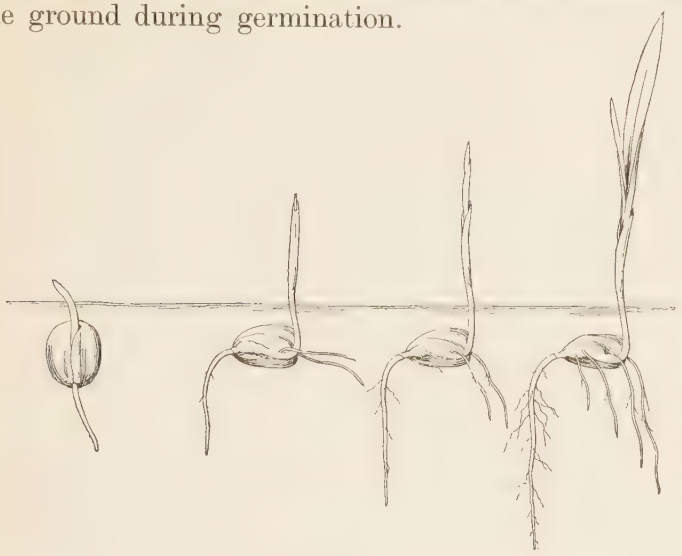


Fig. 122. Germination of a Grain of Corn

Plant several rows of corn in a box. After the second day, take up one row each day. Study the development of the root and stem and observe that the food in the endosperm is gradually absorbed.

Planting Seeds in Boxes

Seed boxes. Boxes for growing seedlings may be sixteen inches long, six inches wide, and six inches deep. Three or four half-inch holes should be bored in the bottom for drainage. Larger boxes may be used, provided they are not too heavy to handle. Flowerpots and

smaller boxes, may also be used, but they give greater difficulty in regulating moisture. The same may be said of the "flats" used by florists. Zinc trays about three feet long, one inch deep, and twelve inches wide should be provided. The dimensions of the trays may vary, depending upon where they are to be used. They should be constructed so that they may be used on the window sill, either inside or outside of the window.

Soil. A soil prepared by mixing two parts of garden soil with one part of manure and one part of sand will be suitable for germinating seeds in window boxes. Before the materials are mixed, they should be sifted through a screen with a quarter-inch mesh. After mixing thoroughly, add water, a small amount at a time, and work the soil with the hand or with a garden trowel, so that all parts will become equally moist. The amount of moisture added should be such that the particles will fall apart slowly when a handful of the soil is pressed lightly together. Prepare a quantity of soil so that it will be ready for use.

Drainage material. Some coarse material must be provided for drainage. Broken pieces of flowerpots, crushed stone, small cinders, and fibrous pieces that will not pass through the screen easily will serve the purpose.

How to plant large seeds. In the bottom of the box place about an inch of drainage material. Then fill in soil so that the surface is within two inches of the top of the box. Push the earth well into the corners of the box and make it smooth and level with a piece of board.

Place seeds in the box and cover all of them with soil, so that after it has been made firm with a flat piece of board, the box will be filled to within half an inch of the top. Water with a garden sprinkler and keep the box covered with a pane of glass until the seeds begin to come up. Keep the box at living-room temperature as nearly as possible. In schoolrooms, where the temperature is low on Saturdays and Sundays, seeds should be planted on Monday. This will give them an opportunity to germinate during the week, while the room is warm. Germination may also be hastened by soaking the seeds for twenty-four hours before planting them.

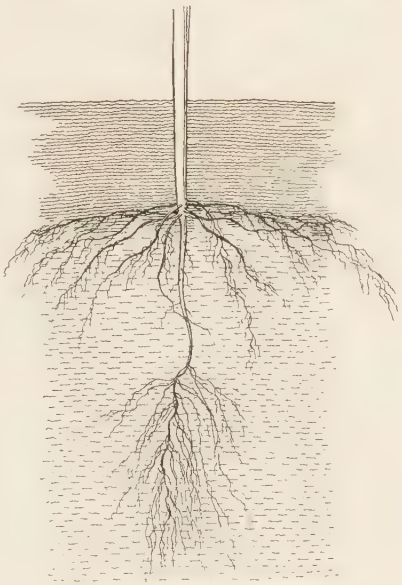


FIG. 123. A Plant grown from a Seed that was planted too deep

Much of the vitality of the plant was lost in forming a double set of roots

Sowing small seeds. Cabbage, lettuce, and other small seeds should have the soil prepared as for large seeds, excepting that the box should be filled with soil to within half an inch of the top before planting. The seeds may be planted in rows or sown in the seed bed. If they are to be sown, divide the box into as many spaces as there

are kinds of seeds. Sow them so that there are about half a dozen per square inch, and press them down evenly into the soil with a flat piece of board. Place a label for each kind on the side of the box. Sift soil on the seeds to cover them to a depth of about two or three times their own thickness. A sieve for this purpose may be made by taking the bottom out of a small box and tacking on wire netting with a mesh about the size of that used for door screens. Press down the soil just enough to make it smooth. Place over it a single layer of cheesecloth, and water the seeds by sprinkling water on the cloth. The box may then be covered with glass until the seeds come up. If the seed bed becomes too moist, the glass must be raised slightly to admit air, which will absorb the drops of water collected on the under surface. A glass cover like that shown in Fig. 118 is very useful for small germinating seeds. The seedlings may remain under it until they have attained considerable size.

Fig. 124. Watering Small Seeds

The seed boxes should be kept in a very warm place near a stove or radiator for two or three days after

planting; then they may be placed in a window near the pane, where they will obtain as much sunshine as possible. Drafts must be avoided. The boxes must be moved away from the window on cold nights.

Seedlings may be grown successfully in either east or west windows, but the best results are obtained in south windows.

The depth from which seeds may come up will depend upon one or more of the following conditions: the supply of air, the structure of the embryo, and the amount of nourishment stored in the seed. There is an optimum depth at which the best results may be obtained in each case.

Transplanting

When the second leaf begins to form, the seedlings are ready for transplanting. This must be attended to as soon as the plants are ready, especially if they are crowded in the box. The greatest difficulty met with in producing seedlings in a window is that they tend to become weak and spindling. If transplanted at the proper time, they will produce more roots, the stem will become stronger, and a more vigorous leaf growth will take place. Fig. 125 illustrates two tomato plants. They were growing in the same box side by side. The plant on the left was permitted to continue its growth in the germinating box after the plants in the box were thinned out; the one on the right was transplanted to another box.

Soil. The soil should consist of one third garden soil or fibrous loam, one third well-rotted manure, and one third sand. Before mixing, sift the materials through a quarter-inch screen. Then give the compost enough water to hold it together, but not enough to make it

FIG. 125. Tomato Plants

a, taken out of the seed box without transplanting; *b*, transplanted. The line indicates the depth to which the plants should be set when they are transplanted to the garden

sticky. The soil will be in the best condition by being prepared the day before it is to be used.

Boxes. Boxes similar to those used for germinating the seeds will be suitable for the seedlings until they are large enough for setting in the open ground. Garden space may be economized by letting the plants grow to be of considerable size in the box before they are planted in permanent places.

Flowerpots. Flowerpots may also be used; the four-inch are best. In greenhouses two-inch pots are frequently used, but they are too small for house purposes. Pack the pots in boxes after the plants have been set in, and fill soil, moss, or leaf mold around and between them, to retain the moisture. The boxes containing the pots

Fig. 126. Cabbage Plants growing in Tin Cans

should be well drained. Gardener's flats or other boxes about four inches deep are excellent for this purpose.

Tin cans may be used as flowerpots. Place them in a hot stove or furnace until the solder is melted off; then remove the bottoms and open the cans along the sides. Strings tied around the cans, as indicated in Fig. 126, will keep them from coming apart.

Preparing the soil for seedlings. Whether boxes, flowerpots, or cans are used, place a layer of half an inch of pebbles, cinders, or pieces of broken flowerpots at the

bottom for drainage; on this place a layer of about an inch of coarse material (fibrous loam or manure) such as will not go through the screen. Then fill in soil to within half an inch of the top. Pack the soil down carefully, so that there will be no pockets or vacant spaces in the corners or along the sides.

Fig. 127. Picking up a Seedling with a Dibble

Taking up seedlings. Water the seedlings the day before they are to be taken up, so that the soil will be in good condition. With a flat stick or a transplanting fork lift out a clump of soil with seedlings. Take them out of the clump carefully, one at a time; injure the root hairs as little as possible, and discard all weak plants.

Planting seedlings indoors. Plants put in boxes should be set in rows two inches apart each way and one inch from the sides and ends of the boxes. In case flowerpots or tin cans are to be used, put one strong plant in each. Make a hole with a dibble, pick up a plant with the fingers, and put it in place, or, if the seedling is a very small one, pick it up with a dibble, as indicated in Fig. 127. Care must be taken that no part of the delicate seedling is crushed. Set the plant deeper than it stood in the germinating box (see Fig. 128). Parts of long, slender roots may be pinched off to induce branching.

Fig. 128. A Tomato Plant

The line on the plant indicates the depth to which it should be planted

Place a finger on each side of the seedling and press the soil down gently, but exercise care in handling the stalk; if that is bruised, the chances are that your plant will die. The soil must be close around the roots, so that the lower as well as the upper part of the hole is well filled. If a space is left below the roots, the plant will be unable to obtain either proper support or food.

Watering. After all the seedlings have been put in place, water them with a sprinkler. Hold it a short distance above the plants, so that the water will come down upon them with sufficient force to settle the soil around the roots. Keep the plants under a glass cover for at least a week (see Fig. 118). Tumblers may be inverted over plants in pots or cans. The amount of water they will need from time to time depends upon the condition of the room and the nature of the soil. It must be sufficient to reach all the roots; merely wetting the surface does little good. The holes for drainage must be kept open, so that the soil will not become too wet. If it fills with water, the plants will die for want of air.

Light. The seedlings should be kept out of the direct rays of the sun for two or three days after planting; then they may be placed as near the windowpane as possible. Turn them daily, so that they will not grow one-sided.

Cultivation. If the soil hardens, dig up the upper layer with a knife blade and crush the small clods with the fingers. A loose layer on top will admit air into the soil and help it to retain moisture. Water the soil in the evening and cultivate it the next morning.

Plan of the Home Garden

Rows. The rows should run north and south as nearly as possible. This will allow an equal distribution of the sun's rays on the different parts of each plant. If the rows are too long for any one kind of vegetable, two or more kinds may be planted in the same row. Plants that mature at about the same time should be placed together. In a large garden the rows should be far enough apart for cultivation by horse power; they may be closer together in small gardens, but at least one foot should be allowed for using the wheel hoe. So far as possible, plants in adjoining rows should be graded as to size. If small plants are placed in rows next to large ones, they will obtain sunshine during only a part of the day.

Space required by vegetables. Radishes, beets, and other crops that have a taproot with a small amount of top will admit of close cultivation, and for this reason need very little space. Cabbage, Brussels sprouts, and cauliflower need more space, on account of their broad, spreading tops. Tomatoes grown on supports require less room than those allowed to spread on the ground without support. Corn must be given more room, on account of the spreading, fibrous roots that must provide nourishment and moisture for the stalk and ear. Space for squashes and pumpkins may be economized by planting them in corn rows, so that the vines may spread among the corn after that has been cultivated. Vines may also be permitted to run in potato patches after they are nearly matured.

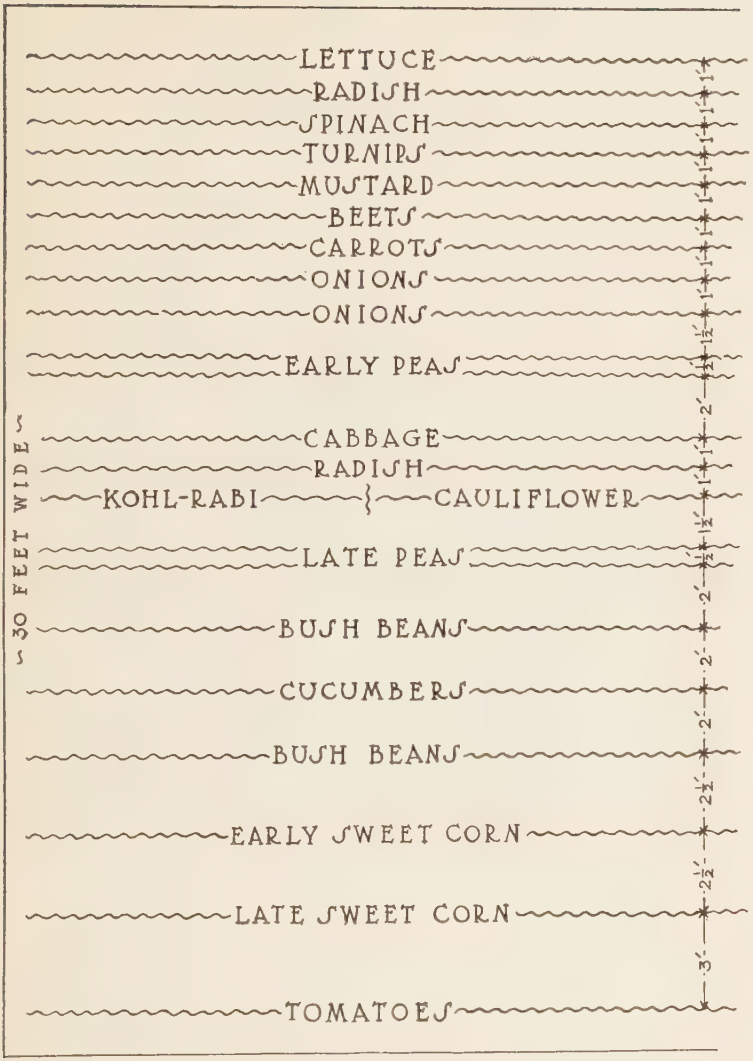


Fig. 129. Planting Plan of a Small Garden

The rows may be of any desired length

Perennials. Gooseberry and currant bushes, rhubarb, asparagus, and other perennials should be placed along one side of the garden. Cold frames and hotbeds should run parallel with the perennial plants. Nothing must interfere with the plowing, which should be done the long way.

FIG. 130. A Home Garden in Sherborn, Massachusetts

The photograph was taken September 1. All of the crops growing are succession crops

Succession of crops. Two or three crops may be grown on the same land each year. Those maturing at about the same time should be planted in adjoining rows. The tillage demanded by the first crop should be such as will leave the land in proper condition for the succeeding one. The crops should be so unlike each other

that they will not carry disease and insects from one to the other. The best results may be expected if each of the crops demands a different kind of food element. Crops grown for roots may be followed by a tall crop that makes its growth mostly aboveground. Radishes

FIG. 131. A Home Garden in Cambridge, Massachusetts
The photograph was taken August 1

and beets may be followed by tomatoes. If late radishes and beets are to be grown, they should not succeed early crops of the same kind, as there is less danger of failure if they are planted with other late, low-growing vegetables in some other part of the garden. Sometimes a perennial crop may be succeeded by annual crops. If

asparagus and rhubarb are to be discontinued, the land may be plowed up and planted in late crops after the last cutting. After an early crop is harvested, the entire plot may be plowed up and planted in strawberries.

Companion crops. In many cases it is advisable to grow together two crops which mature at widely different seasons. Early onions may be grown with cabbage; the cabbage plants, as they grow and spread, will gradually fill up the space left by the onions as they are pulled up and used from time to time. Tomatoes may be started in the same row with medium early crops.

Three crops. Any of the early crops may be succeeded by late corn. The corn may have squashes, pumpkins, citrons, or beans growing with it. The beans may be planted near the corn hills, so that the stalks may serve as supports.

Planting plan. February is a good time for planning a garden. No two garden plans will be alike in every particular; the shape and size of the land, the nature and condition of the soil, as well as the taste of the gardener, will cause wide variations. All such conditions should be considered before time for planting.

Measure your land, and on a large sheet of paper make a planting plan of your garden, using a definite scale.

Planting table. Prepare a planting table that will contain the approximate date on which the crops are to be planted, the names and the varieties of the vegetables, and the quantity of seed to be planted. The table on page 234 may be used as a model.

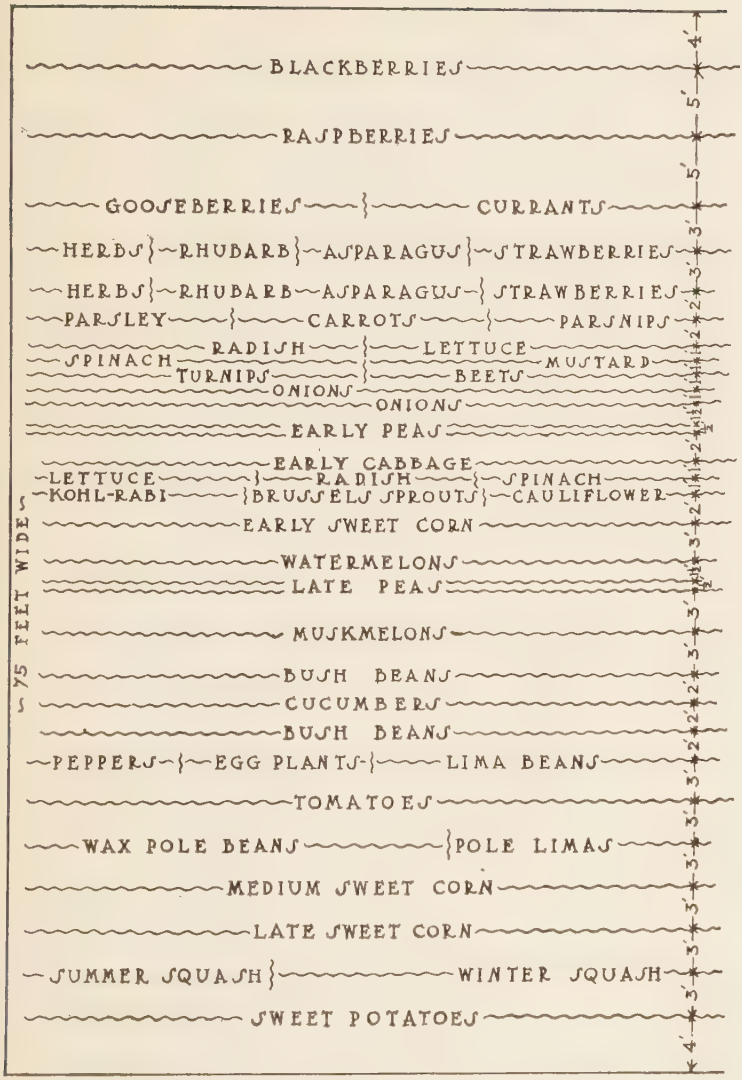


Fig. 132. Planting Plan of a Large Garden

The rows may be of any desired length

Planting Date	Vegetable	Variety	Quantity
March 1 Under glass In boxes.	Cabbages	Early Jersey Wakefield	1 pkt.
March 1 Under glass	Celery	White Plume	1 pkt.
March 1 Under glass	Cauliflower	Dwarf Erfurt	1 pkt.
March 1 Under glass	Eggplant	Black Beauty	1 pkt.
March 1 Under glass	Lettuce, head	May King	1 pkt.
March 1 Under glass	Peppers	Ruby King	1 pkt.
March 1 Under glass	Tomatoes	Stone	1 pkt.
April 1	Beets	Eclipse	1 oz.
April 1	Carrots	Half-Long Danvers	1 pkt.
April 1	Lettuce, leaf	Early Curled Simpson	1 pkt.
April 1	Mustard	White	1 pkt.
April 1	Onion seed	Yellow Danvers	1 oz.
April 1	Onion sets, bottom	Prizetaker	1 qt.
April 1	Parsley	Triple Curled	1 pkt.
April 1	Parsnips	Hollow Crown	1 pkt.
April 1	Peas, early smooth	Farquhar's Prolific	1 qt.
April 1	Potatoes		1 pk.
April 1	Radishes, short	Scarlet Turnip	1 oz.
April 1	Spinach	Victoria	1 oz.
April 1	Turnips	Purple Top	1 pkt.
April 15	Sweet corn, early	Peep o'Day	$\frac{1}{2}$ pt.
April 15	Peas, wrinkled	Telephone	1 pt.
April 15	Radishes, long	Long Scarlet	1 oz.
May 1	Beans, bush	Golden Wax	1 pt.
May 1 Seed bed	Cabbages	Late Flat Dutch	1 pkt.
May 1	Sweet corn, medium	Potter's Excelsior	1 pt.
May 1	Cucumbers	White Spine	1 pkt.
May 1	Muskmelons	Rocky Ford	1 pkt.
May 1	Watermelons	Early Fordhook	1 pkt.
May 15	Beans, bush	Dwarf Horticultural	$\frac{1}{2}$ pt.
May 15	Beans, pole lima	King of the Garden	$\frac{1}{2}$ pt.
May 15	Squash, summer	White Bush	1 pkt.
May 15	Squash, winter	Improved Hubbard	1 pkt.
May 15	Sweet corn, late	Stowell's Evergreen	$\frac{1}{2}$ pt.

Prepare another planting table containing spaces for the dates on which you planted, the names of the vegetables, the varieties, the dates of harvest, and notes that will help you in next year's work. Fill out the table as the work progresses during the summer. Your table should include the dates when plants were set out, also when succession crops are sown.

Plan of the School Garden

An area forty by sixty-four feet may be divided into twenty plots, each four feet by eleven feet, that may be used as individual gardens. It also contains space for one large plot that may be used for experimental purposes. Each of the small plots contains a thousandth part of an acre, with a small allowance for waste. By making the plots a convenient fractional part of an acre, the rate per acre at which the crops are produced, as well as the quantity of fertilizer needed for each plot when the amount per acre is given, may be calculated easily. If fertilizer is to be applied at the rate of one ton per acre, the amount for each plot is found by dividing two thousand by one thousand. The rate of crop production may be obtained in the same way.

The regular path is two feet wide; it contains half the land in the plot. When the succession crop is planted, the path should be spaded up. No paths are needed for the later crops, that stand from two to three feet apart, or for cover crops.

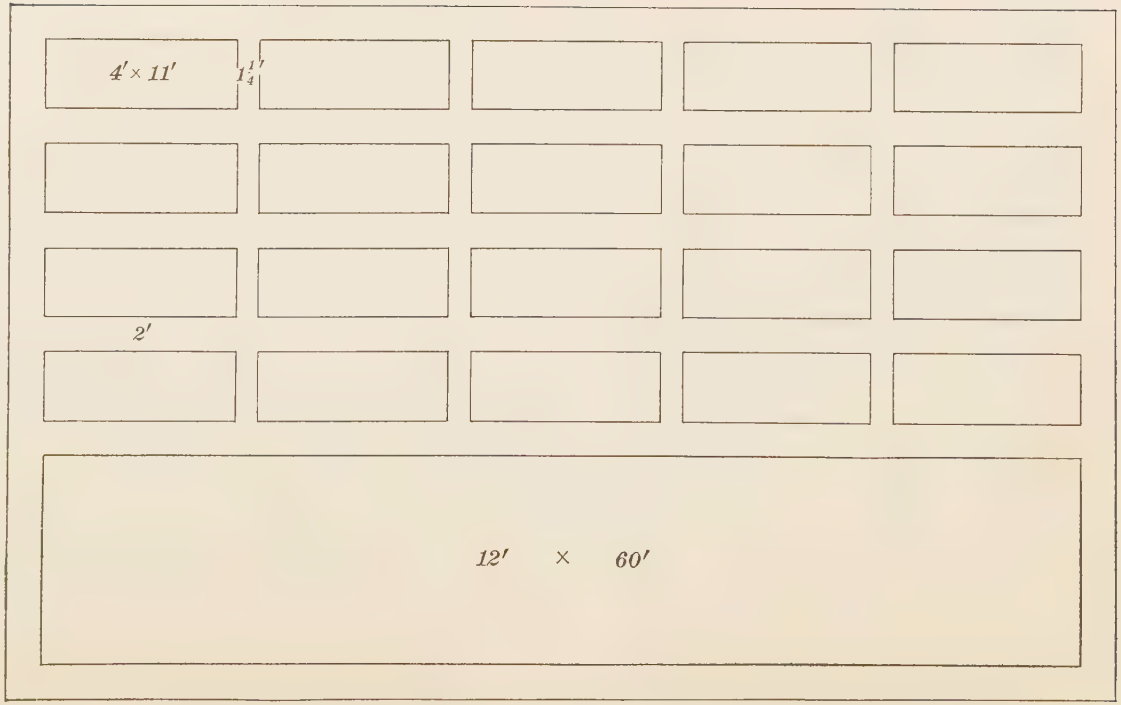


Fig. 133. A School-Garden Plan

Fig. 134. School Garden in Griggsville, Illinois

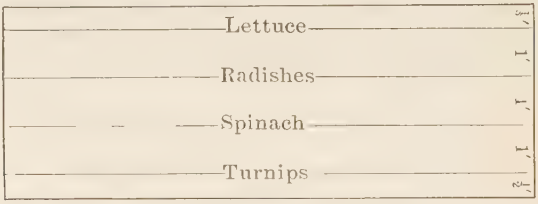
The photograph was taken March 1

Fig. 135. School Garden in Griggsville, Illinois

The photograph was taken June 1

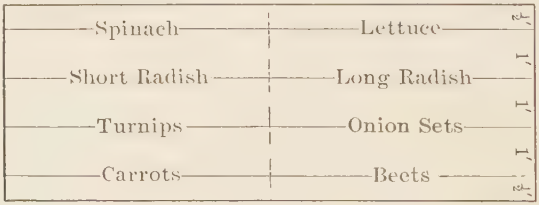
Planting Plans

The following planting plans may be used either for the school garden or for any home garden. The garden may be made of any length desired, and the width may be increased by combining two or more plots, or the dimensions indicated may be used. The plots are drawn on a scale of four by eleven feet.



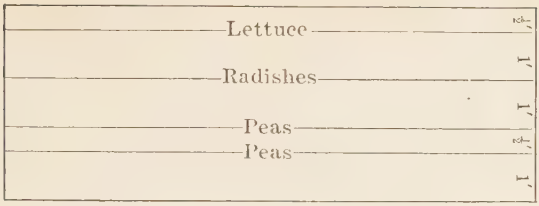
Plan I

Use some variety of leaf lettuce. The turnips may remain in the ground until after tomatoes, or some other succession crop, are planted. The tomatoes should be planted in the middle of the plot after the radishes and the spinach have been removed



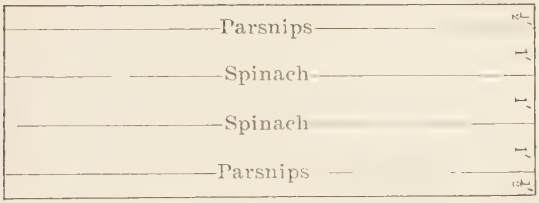
Plan II

Plant a succession crop when the radishes are taken out. Any of the medium early or late crops may be planted. This plan indicates how crops that require the same attention and that have similar habits of growth may be planted in the same row. The rows containing carrots and beets may be marked by sowing with them a few radish seeds



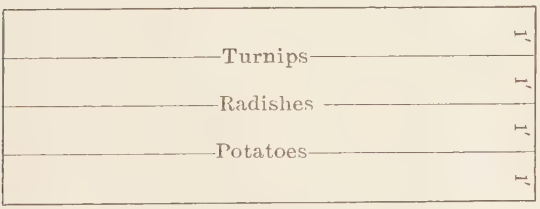
PLAN III

Round peas are best for early planting. Corn, beans, tomatoes, or some other crop may take the place of the radishes when they are harvested



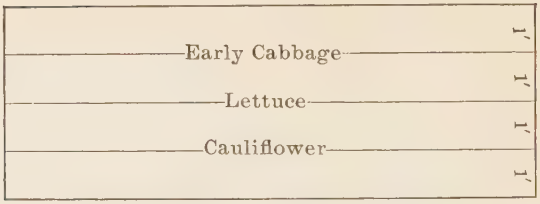
PLAN IV

Parsnips should be planted at one side of the garden, so that during the winter they may be left in the ground, where they will not interfere with fall plowing



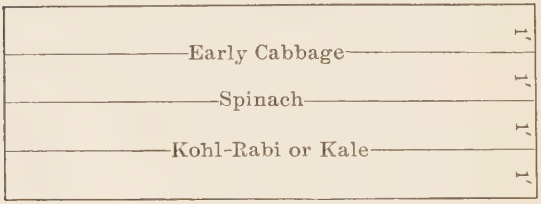
PLAN V

Plant as soon as the frost is out of the ground. The turnips and potatoes will need all of the ground after the radishes are harvested. Use the land for a fall garden after the potatoes are dug



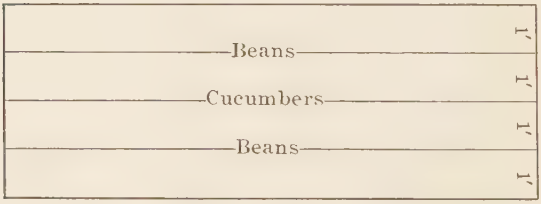
PLAN VI

Start cabbage, lettuce, and cauliflower plants in boxes the first of March Set plants out about two weeks later than in the early garden



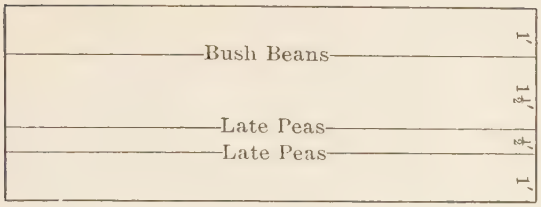
PLAN VII

Start kohl-rabi and cabbage plants in boxes the first of March. Plant two weeks later than in the early garden. This sowing provides for a crop of spinach that will come about two weeks later than the earliest



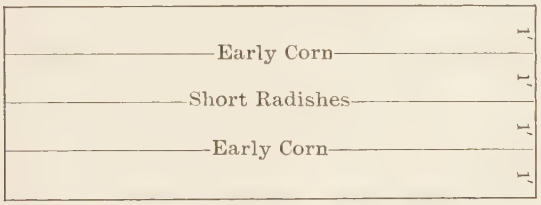
PLAN VIII

Plant early bush beans and cucumbers as soon as all danger from frost is over. The cucumbers will need all of the land after the beans are harvested Cucumber plants may be started on inverted sod in a cold frame



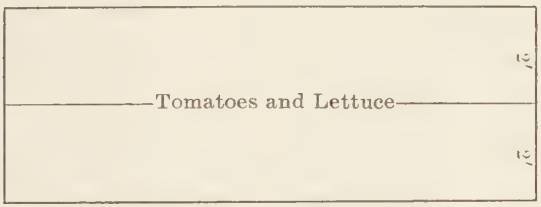
PLAN IX

This planting may be made after the radishes, leaf lettuce, and spinach in the garden have been used. Plant some variety of tall-growing peas



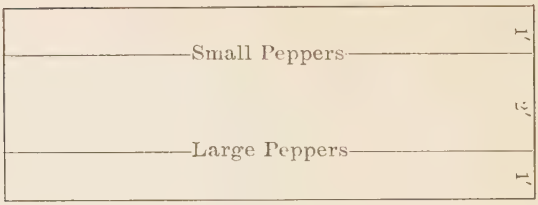
PLAN X

Sow radishes when corn is planted; this will provide for a succession. After the corn matures, the plot may be spaded up and planted in late turnips or some other fall garden crop



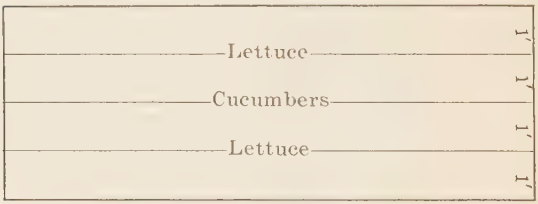
PLAN XI

Tomato and lettuce plants may be set out at the same time. Start tomato plants in boxes the first of March. Set them out after all danger from frost is over. Start lettuce plants in the seed bed three weeks before needed. Set tomato plants two and a half feet apart, with lettuce plants between them The lettuce plants should be in the same row as the tomatoes



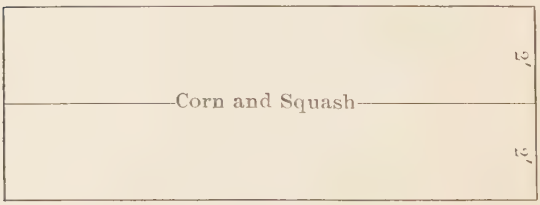
PLAN XII

Set pepper plants one foot apart. Start them in boxes the first of March Pepper plants will need the entire summer to make their growth



PLAN XIII

The cucumber plants may be started on sod and planted in the garden late in July. Set them three feet apart. Sow leaf-lettuce seed and shade the seed until it comes up



PLAN XIV

Plant corn in hills two feet apart, and squash in the same row, six feet apart. Plant the squash seeds halfway between the hills of corn. Make corn rows three feet apart and plant squash in the alternate rows

The crops in Plans I–V may be planted in the spring as soon as the frost is out of the ground; it will not injure them if the ground freezes after the seeds are in. In central latitudes, such as Boston, Chicago, and Kansas City, these gardens may be planted from the fifteenth of March to the first of April. Where there is sufficient moisture in the soil, fall plantings may be made from the fifteenth of August to the first of September. In the Southern states, plant in February for early spring crops, and from September to November for winter use. Plans IX–XIV may be planted as a succession after the crops in Plans I–III are harvested.

Plants which mature at about the same time should be kept together, so that the whole plot may be sown in vetch or some other fall cover crop just as soon as the crop is harvested.

Planting the gardens. After the earth has been spaded and raked over, stretch a line the entire length of the plot, so that the rows in the small gardens will join to form continuous rows in the large area. Plant the middle rows first, then those outside. So far as possible, a row should contain crops that require about the same attention and mature at about the same time. This method will economize space and enable the student to learn the use of the wheel hoe.

Watering the garden. The land can usually be kept moist by keeping a loose layer of soil on the surface. After every rain cultivate the garden as soon as it can be worked. During severely dry weather in midsummer

it may be necessary to water the garden. A sufficient amount of water must be given the soil at such times to reach the roots of the plants, and each time after it has been watered the soil should be thoroughly cultivated as soon as it is in good condition for working.

Fig. 136. Watering a Garden

The photograph was taken in a garden in Arlington, Massachusetts, August 1

Beans

Soil. Beans require a warm, light soil. Fresh manure must not be used. Soil that has been treated with a coating of stable manure in the fall will be in good condition for planting. Well-decayed manure may be applied early in the spring. The crop may be increased by working a mixed garden fertilizer into the soil just before planting. An extra supply of nitrogen need not be

FIG. 137. Children's Home Garden Exhibit, Middlesex County Fair, Framingham, Massachusetts

given between the rows. Beans, because of bacteria which live in the small tubercles on their roots, have the power of obtaining nitrogen from the air which is in the soil.

Planting. Beans cannot endure frost, but it pays to take some risk. By planting a few as soon as there is

Fig. 138. Planting Bush Beans

some degree of certainty that they will not be taken by the late frost, and then repeating the planting every two weeks, a succession may be obtained that will provide a supply during the greater part of the summer.

Plant dwarf or bush beans in rows two feet apart. Scatter the seeds so that they will be about two inches apart, and cover to a depth of two inches. Press the soil

firmly above the beans with the back of a hoe. Dwarf beans may also be planted in hills eight inches apart. Plant five or six beans in a hill.

After the beans are well started, thin them so that they will stand about four inches apart in the row. Beans planted in hills should be thinned to three in a hill. Keep the strongest plants as far as possible. Less seed

Fig. 139. Planting Pole Beans

may be used for planting later in the season, when the soil is warm, for the seed is far more likely to come up.

Bush Lima beans require soil well supplied with humus. Plant as soon as the soil has become warm in the spring. Make the rows two feet apart, scatter the seeds so that they will be about two inches apart, and thin so that the plants will stand six inches apart.

Pole beans should not be planted until the ground has become warm in the spring. The seed will rot if the soil is cold or soggy. Before planting, set poles four

FIG. 140. A Bean Pole fastened with a Wire
The photograph was taken September 15

feet apart each way. Place eight or ten beans around each pole, and cover to a depth of two inches. Place Lima beans with the eyes down. After the plants are well started, thin to three strong plants for each pole.

Setting poles. After the soil is ready for planting, set a post at each end of the row and stretch a wire between the posts. It may be placed about four feet from the ground. Select poles that are six or seven feet long and from one to two inches in diameter. Drive them a foot into the ground and fasten the wire to them.

Culture. Never cultivate beans when the leaves are wet, but always hoe before the ground becomes hard from rains. Keep the soil loose to a depth of two inches. Pull weeds growing near the stems. A top-dressing of poultry manure, ashes, or compost around the plants will be of much benefit, hastening maturity and increasing the yield. During hot weather draw fine soil around the vines to serve as a dust mulch for retaining moisture.

Diseases. For anthracnose, or "pod spot," spray with weak Bordeaux mixture or with sulfur in water, and avoid low, damp ground. Rotate the crop. Spray with Bordeaux mixture for rust.

Pests. If the seeds contain weevils, scatter them in a pan of water and reject all that float. For leaf beetle, spray with arsenate of lead. Wash green beans carefully before using if the plants have been sprayed with arsenate of lead.

Beets

Varieties. There are two leading classes of beets: the short-season, turnip varieties for early summer or late fall use, and the larger kinds. The turnip-shaped beets make a rapid growth and will be ready for use

in eight weeks. The half-long and the long are used for the main crop. They grow larger than the turnip varieties and are better adapted to the dry season during the summer.

Soil. Beets do best in a light, rich soil. The surface soil must be in good condition for the early varieties. The late ones must have a well-cultivated, rich soil at least six inches deep.

Sowing. Beets are hardy; they may be sown as early as the ground can be worked in the spring. The seeds will come up sooner if soaked overnight. In the spring sow them about one inch apart and cover to a depth of one inch; in summer, when the ground is drier, the seeds should be covered to a depth of two inches. For a succession, sow early varieties every two weeks until the first of June.

Sow the main crop early in May. The summer varieties require four or five months to mature.

Thinning. What is commonly known as a beet seed is a fruit which contains several true seeds. The clumps that come up must be thinned so that the beets will stand from three to six inches apart, depending upon the variety. The plants discarded in thinning make excellent greens.

Transplanting. Plant what the farmers call thinnings in any part of the row where seeds have failed to come up. Transplant when about five inches high. Remove at least half the leaves, water thoroughly, and shade the plants for two or three days.

Culture. Weeds that grow near the plants should be pulled by hand. Keep the surface soil loose, to retain the moisture, but be careful not to loosen the beets.

Storage. Store beets in sand in the cellar or in pits. Leave on two or three inches of the top and do not remove the long taproot.

Diseases. To avoid scab, rotate and do not plant after potatoes. If leaves become spotted, remove them and spray the healthy ones with Bordeaux mixture.

Pests. Use Bordeaux mixture for flea beetles. Dust the dry powder onto the leaves when they are moist. Use poisoned bait for cutworms. Dig out and destroy white grubs. Use kerosene emulsion for all plant lice and bugs. For webworms, spray the underside of the leaves with a tablespoonful of Paris green and a pint of fresh-slaked lime in two gallons of water. *Do not eat the leaves after they have been sprayed.*

Brussels Sprouts

The young plant is more susceptible to frost than the cabbage, but the mature plant will stand considerable freezing. In fact, freezing improves the quality of the sprouts. In small gardens Brussels sprouts may be used to follow bush beans or other crops that mature in July.

Soil. The soil should be a deep loam that has a good capacity for moisture. Soil which has had an application of rotted manure in the spring will be in good condition for planting. Nitrate of soda may be applied to advantage.

Sowing. For the early crop, sow seeds in boxes or in seed beds out of doors. Transplant in June. Sow seed for the late crop in June and transplant about the middle of July or the first week in August. Set the plants from one to two feet apart in the row; the rows should be thirty inches apart.

Culture. Keep the surface soil fine, to hold moisture. When the sprouts begin to form, cut off some leaves near them.

Harvesting. Cut off sprouts as soon as they are large enough to use. In cold climates leave them in the garden until freezing weather sets in; then take them up and store them in a cool cellar. In localities where the winters are mild, leave them in the garden during the winter.

Diseases and pests. For directions for protecting against diseases and pests, see under "The Cabbage."

The Cabbage

Plants. For the early varieties, sow seeds in boxes indoors or under glass about the first of March. The plants will be ready in from thirty to forty days. Refer to page 221 for complete directions about preparing soil for boxes and sowing the seeds. Transplant the seedlings after the second leaf has formed. In their new quarters, set them deeper than in the seed bed, and about two inches apart each way. For succession, sow early cabbage seeds at intervals of two or three weeks.

Seeds for late cabbages should be sown out of doors in rich, fine soil from the first to the middle of June. Sow in rows six inches apart and thin to two inches in the row. Keep the soil in good tilth.

Soil. The soil should be plowed or spaded to a depth of at least six inches. Well-decayed manure laid in the bottom of the furrow when plowing in the spring will encourage the roots to reach down for nourishment. If enough manure cannot be obtained, a mixed commercial fertilizer that contains nitrogen, phosphoric acid, and potash may be harrowed in after plowing (see p. 199). The size of the cabbages may be increased by giving the land subsequent dressings of nitrate of soda, at the rate of about four hundred pounds per acre, applied in three equal dressings — the first at transplanting, the others at intervals of a month or less. The soil may be kept moist around the plants by a mulch of fresh manure, which will also supply fertilization.

FIG. 141. Cabbage Seedlings ready for transplanting to Other Pots or to Boxes

Transplanting. The plants should be from three to five inches high before transplanting. Those hardened by setting the boxes out of doors for a short time each day when

the weather is favorable will stand light frosts and may be set out in April. They should be set deeper than before, to encourage a stronger growth of root and to avoid having the roots loosened by the wind.

The early varieties should be set in rows two feet apart, with a distance of eighteen inches between the plants. Late cabbages should be at least two feet apart each way.

Diseases. For clubroot, dress the land with air-slaked lime at the rate of about seventy-five bushels per acre; destroy diseased plants and rotate the crop from year to year.

For prevention of black rot, rotate the crop and remove all affected leaves.

Pests. To destroy the cabbage worm the plants may be sprayed with Paris green or arsenate of lead soon after they are set out. When the heads are nearly grown, they should be dusted with hellebore.

If a plant has been killed by a cutworm, dig for it near by. The other plants may be protected by paper collars. (For poisoned bait, see p. 203.)

For protection against the root maggot, place paper shields closely about the stems immediately after setting out, and apply nitrate of soda around but not touching the plants; or place a tablespoonful of air-slaked lime or tobacco dust around each plant. Burn all plants that have been killed by root maggots.

For aphis and thrips, use kerosene emulsion or whale-oil soap.

For the flea beetle use air-slaked lime or tobacco dust, or, while the plants are young, spray with Bordeaux mixture and Paris green at the rate of one ounce of Paris green to twelve gallons of Bordeaux mixture.

White grubs may sometimes be found by digging around the roots of weakened plants.

It is very important that all cabbage leaves, old stalks, and other rubbish should be raked up and burned after the crop has been harvested.

Storage. To keep for the winter, cabbages should be pulled up with the leaves on. They may be stored in a cellar, or in a barrel set into the ground so that its top is even with the surface of the soil, the barrel being covered with boards and gunny bags; or they may be set in trenches, heads down, roots reaching above the surface. Pack straw firmly around the heads, and cover with loose soil. A dry slope is the best place.

Carrots

Varieties. The short varieties of carrots are best for early sowing, the half-long are used for medium-season crops, and the long are sown late. The short kinds make rapid growth in the warm, moist surface soil early in the spring. After the surface soil is dried by the heat of the summer sun the long, deep-rooted varieties thrive best. Large, long, coarse varieties are sown late in the season for stock.

Some carrots contain a large yellow core, or heart, that has little food value, while in others this core is entirely absent.

Soil. Carrots for early use should have a warm and light soil well supplied with humus. A garden that has had a good coating of barnyard manure in the fall will be in good condition for planting. Dig or plow the land to a depth of eight inches, especially for the long varieties.

FIG. 142. Comparative Growth of Carrots and White Mustard
a, carrots; *b*, white mustard. The seeds were sown at the same time

Before sowing the seeds all large clods should be broken in order to produce straight, well-proportioned roots.

Sowing. The early crop may be sown about the first of April. Sow the seeds thickly in rows, one foot apart and half an inch deep. Thin to about two inches apart. Sow in May or June for the main crop. Thin to three or four inches, depending upon the variety. The long

varieties will grow all summer, and for this reason it may be better to have the rows eighteen or twenty inches apart, to give more room for cultivation. When grown for stock, the rows are usually placed two and a half feet apart, to admit of cultivation by horse power.

Culture. Carrots germinate slowly, so that they are sometimes hindered in coming up by a crust formed after rain. A few radish seeds planted in the row will help break the crust, and mark the row so that cultivation may begin before the carrots come up.

Pull all weeds out of the row by hand before they are large enough to loosen the carrot roots when weeding. Keep a dust mulch around the roots, to retain moisture, but do not hill up; it is natural for some varieties to make considerable root growth aboveground.

Succession. Provide for a succession by buying several kinds of seed and by sowing a number of times. The early varieties should be sown at intervals of two weeks.

Cold frame. Sow early carrots in a cold frame in March, in rows six inches apart, and thin to two inches apart in the row. The temperature should be from 50 to 60 degrees.

Storage. Store the late varieties in sand in the cellar, in pits, or in cold frames.

The Cauliflower

The cauliflower is more tender than the cabbage; it requires a moist climate. In localities where the summers are dry and hot it should be started early, so that it will

make its growth during the spring months; as a late crop it may make most of its growth during the fall months.

The heads of cauliflower must be protected from the sun. This is accomplished by tying some of the leaves above the heads while the plants are dry and free from insects.

Soil. The soil must be rich and moist. Land that has been made by overflowing streams will produce large heads. Spade or plow the soil to a depth of at least eight inches. In the spring give it a very heavy coating of stable manure.

Starting plants. For the early crop start seeds in window boxes or hotbeds a month before the plants are needed. For late varieties sow seeds in seed beds in May or June.

Transplanting. When the second leaf appears, seedlings that have been started in boxes should be transplanted to other boxes. Set them two inches apart each way. Plants that have been started in outdoor seed beds may be set in a permanent place in the garden. Transplant the same as cabbage. Set the plants from eighteen inches to two feet apart, depending upon the variety, in rows two feet apart.

Culture. Keep stirring the surface soil, to retain moisture. One or two dressings of nitrate of soda raked in while the plants are young will increase the yield. When the plants are ready to form heads, a coating of about two inches of coarse stable manure will help to keep the soil moist.

Harvesting. Cut the heads as soon as they are well formed. Light frosts do not injure cauliflower, but it cannot be kept over winter. Keeping causes it to lose its delicate flavor.

Diseases and pests. (See under "The Cabbage.")

Celery

Varieties. The early varieties are known as "self-blanching." The peculiarity of the self-blanching kinds is that the inner leaves and heart are whiter than in the later ones; this makes the process of blanching easier during the summer months. The late varieties grow taller stalks and require more attention in blanching. After blanching, the celery stalks vary in color from white to rose color or golden yellow.

Plants. Sow the early celery in a box or cold frame in February or March. Merely press the seeds into the soil and keep them covered with a glass until the plants appear. Sow for the late crop in a moist seed bed when the ground is in good condition. Sow the seed thickly, a quarter of an inch deep, in drills six inches apart. If the ground becomes dry or has a tendency to form a hard crust, keep a cloth or a gunny bag over the seed bed until the plants come up.

Transplanting. Thin the plants so that they will stand an inch apart in the row soon after they are well started. Transplant them after the third leaf makes its appearance. Pinch off the taproot, in order to start a strong

bunch of fibrous roots, and set the plants about three inches apart. In May or June set them in rows two or three feet apart and six inches apart in the row.

Soil. Early celery may be grown on upland soil that is moist and in good tilth, but the late kind will show its best results if grown on deep bottom soil. Fig. 143 is an illustration of a celery field in Arlington, Massachusetts. The soil has been made by silt deposited by the overflow of a creek that flows through the garden district. It is rich and deep and contains an abundance of well-decayed humus.

The soil should be spaded or plowed to a depth of eight inches. If it does not contain the necessary fertility, apply well-decayed barnyard manure at the rate of fifteen tons per acre during the preceding fall or early in the spring, or use a mixed fertilizer at the rate of about one thousand pounds per acre.

Cultivation. Keep the soil moist with a dust mulch by cultivating after every rain. Pull weeds away from the plants by hand.

Blanching with boards. This method is very successful during the summer. Set boards one inch thick and one foot wide against the plant, slanting them slightly inward so that the tops of the leaves may be seen above them. The boards may be held in place with stakes or wires. They should be set when the plants are dry. The celery will be ready for use in from ten to fifteen days, depending upon the season and weather conditions. The boards may then be shifted to other rows.

Earthing. By this method the plants are set on a level. As they grow, the leaves are held together and the earth is gradually drawn around the base of the plant. The earth should not be drawn up so that it

Fig. 143. Blanching Celery with Boards

will cover the heart of the plant, for if any soil reaches the heart, it will cause the tender stalks to decay.

Trenching. Trenching is illustrated in Fig. 144. Dig a trench twelve inches deep; fill it to within six inches of the top with soil that has been mixed with well-rotted stable manure. Set the plants on a little ridge along the middle of the trench. As the plants make their growth, hold the leaves together and draw the soil

up to them, taking care that no soil enters the heart. The land must be well drained. This is a good method of planting celery for fall use in a small garden.

Blanching in beds. Set large, strong plants in beds six inches apart each way, and place boards along the

Fig. 144. Blanching Celery by Earthing

edges of the bed. By this method the celery will blanch itself. The self-blanching varieties should be selected for this purpose. The soil must be moist, deep, and rich.

Blanching with draintiles. When the celery has almost made its growth, gather the leaves in a bunch and slip over it a five-inch or six-inch draintile, depending upon the size of the plant.

Storage. Provide a box with sides about a foot high for storing celery for winter use. Place two inches of sand in the bottom and wet it thoroughly. Leave on most of the roots and pack the bunches close together. The leaves should be dry when the celery is put into the box. Keep the sand moist by pouring water through holes in the sides of the box. No water should touch the leaves at any time.

Diseases. For leaf spot and leaf blight, spray with Bordeaux mixture when the plants are young.

Pests. For insects that eat the leaves, use hellebore; for aphis and thrips, use kerosene emulsion or tobacco water. Pick celery borers by hand.

The Cucumber

Varieties. The small varieties of cucumber are used for pickling. They are very productive and as a rule need less time for growth than the larger ones. The larger varieties are usually preferred for slicing. Special varieties, known as English cucumbers, are used for growing in hotbeds or forcing houses for winter use.

Soil. Cucumbers need a warm, moist, rich, loamy soil; sod land turned over in the fall is excellent. Thoroughly mix with the soil in each hill a shovelful of well-rotted manure. A handful of commercial fertilizer may also be added. Make the hill two feet in diameter. Spade to a depth of six or eight inches. If the soil is heavy add a shovelful or two of fibrous loam.

Planting out of doors. Plant the seeds out of doors after all danger from frost is over, putting ten or twelve in a hill. The hills should be from three to six feet apart each way, depending upon the variety. Thin to

Fig. 145. Planting Cucumbers

four or five plants. When thinning, leave the strongest vines and space widely in the hill, to guard against crowding. Plants that crowd each other cannot obtain food so easily, and the problem of protecting them against the attacks of insects is also greater.

Succession. For a succession sow every two weeks. For pickling sow late in June or early in July.

In cold frames. For the earliest fruit start in inverted sod in cold frames. Take sod from very rich soil. The pieces should be from four to six inches square. Turn them upside down, and pack close together in the frames. Place six or eight seeds in each piece of sod; plant them half an inch deep. As soon as they have made a good start, transfer them to the garden. Harden the plants by giving them some shade for a few days, and thin to the four strongest. Cucumber plants may also be started in five-inch flowerpots or in berry boxes.

Cultivation. Keep a surface mulch until the vines cover the ground.

Harvesting. The vines must be kept in good bearing condition by picking the fruit regularly. If they are left to ripen, the productiveness of the vines is weakened.

Growing cucumbers in glass houses. For market purposes cucumbers are grown extensively in glass houses. The houses are warmed so that the vines may be growing and producing fruit at all seasons of the year. To render the plants productive it is necessary to fertilize the pistillate flowers with pollen from the staminate flowers. This may be done by hand or by keeping a hive of bees in the house. The bees must be fed, for there is not a sufficient amount of food in cucumber flowers to nourish them.

Diseases. For downy mildew and wilt, spray with Bordeaux mixture. Destroy diseased vines and rotate the crop as far as possible.

Pests. Use arsenate of lead for the cucumber worm. Pick the worms by hand. For the striped beetle, plant trap crops of squash, which they will eat in preference to the cucumber plants. A combination of Bordeaux mixture and arsenate of lead may be used to kill the beetles

Fig. 146. A Cucumber House, Arlington, Massachusetts
A hive of bees may be seen near the door

as well as to prevent disease, or shake air-slaked lime or tobacco dust onto the vines. For plant lice spray with tobacco water or with whale-oil soap; the underside of the leaves must be reached. For the flea beetle cover with dry Bordeaux or spray with Bordeaux and arsenate of lead. For root maggots use carbolic acid emulsion.

Endive

Endive is grown as a salad plant and is also used for greens. It may be eaten when the leaves have grown to a height of four or five inches; they lose their tenderness as they grow older. Endive may be allowed to grow until heads have formed. Blanch the inner leaves by gathering the outer ones in a bunch and tying them at the top. This must be done when the leaves are entirely dry. The leaves may also be blanched by covering the plant with boards or with draintiles (see under "Lettuce").

Soil. Endive will grow in any kind of rich garden soil. Two or three dressings of nitrate of soda or liquid manure will cause a stronger growth.

Sowing. Sow the seeds thinly, in rows one foot apart. Thin from eight inches to one foot apart in the row. Use the thinnings for greens or transplant them. For early use, sow as soon as the ground is in good condition in the spring. The late crop may be sown in June or July.

Storage. In the fall, endive may be taken up and transplanted to the cold frame. Leave considerable earth on the plants and pack them close together.

Horse-Radish

Horse-radish is usually obtained by allowing old plants to grow in some out-of-the-way place in the yard or garden. A better quality of root may be obtained by growing it as an annual. Cuttings may be obtained from dealers, or the trimmings from old plants may be used. Select

pieces about half an inch in diameter at the large end. In preparing the roots it is customary to cut the upper end slanting, so that it may be easily recognized in planting. If cuttings are placed upside down, the roots will be inferior.

Soil. The soil should be moist, deep, and rich. Spade ten or twelve inches deep and pulverize, to give the roots an opportunity to grow straight down.

Planting. Plant cuttings from three to six inches deep, twelve inches apart, in rows two feet apart. Set the roots slanting, with the tops in the same direction.

The cuttings may be set out in the fall or in the spring. Plant any of the low-growing vegetables between the rows. If the horse-radish grows so rapidly as to interfere with the vegetables, cut off the tops early in the season. After the other crop is harvested, continue cultivating the soil. Horse-radish will grow until the soil freezes in the fall.

Harvesting. Dig the roots either in the fall or spring. Store in sand in the cellar for winter use.

Kale, or Borecole

Kale is more hardy than cabbage. It makes good greens for winter and spring use; frost improves it. For fall use sow seeds in May or June. For winter and early spring use sow in August or September. The low-growing varieties winter best.

The methods of sowing seeds, transplanting, and setting out the plants are the same as for cabbage.

Fertilize and cultivate the soil as for cabbage.

The low-growing late varieties do best when sown thinly in rows where they are to stand. After the plants are well started, thin to eighteen inches apart.

Kohl-Rabi

Sowing. Kohl-rabi may be started in window boxes or in hotbeds early in the spring. The plants may also be grown for transplanting in seed beds out of doors;

Fig. 147. A Kohl-Rabi Plant

they are not easily injured by frosts. The seeds may also be sown where the plants are to remain. Sow thinly in rows eighteen inches apart. Thin to six or eight inches apart in the row. The thinnings may be transplanted.

Harvesting. Use the enlarged stem when it is about two thirds grown. Later it becomes stringy.

Lettuce

Head lettuce. Head-lettuce plants may be produced by sowing seeds in boxes indoors or under glass. Sow one fourth of an inch deep. After watering, cover the box with a windowpane and set it in a warm place near

Fig. 148. A Field of Head Lettuce

the stove or radiator for twenty-four hours; then move it to a sunny window near the glass. The seedlings should be up in three or four days. Turn the box daily to keep them straight. Transplant to another box when the second leaf appears, and set them deeper than in the seed box and about two inches apart each way.

Seeds for head-lettuce plants may be sown in the garden about the first of April. Sow the seeds in drills half an inch deep and six inches apart. After the plants are well started, thin so that they will be about two inches apart in the row.

Transplanting. When the plants are from three to four inches high, transplant to a permanent place in the garden in rows one foot apart, placing them from six to twelve inches apart in the row, according to the variety.

If the plants are being grown in the garden, thin by using them, and let strong plants continue to grow in the seed bed.

Leaf lettuce. Leaf-lettuce seeds may be sown outside in the spring as early as the ground can be worked, for this plant will endure considerable frost. Sow in drills half an inch deep and six inches apart. Begin using the leaves early and thus thin the rows. Sow every two or three weeks for a succession. Some of the plants may be transplanted; this will make them come later and do away with the necessity of sowing so often. The late plants do best if sown where they are to remain.

Soil. Lettuce requires good ground that has been well pulverized and enriched with thoroughly rotted manure. Spade or plow to a depth of four or five inches and rake the soil fine.

Culture. Lettuce need not be cultivated deep, but the surface mulch must be kept in good condition. After every rain go over the land with a garden rake, to prevent the formation of a crust.

Companion crop. Lettuce may be grown as a companion crop for early cabbage by alternating rows of lettuce and cabbage. Cabbage plants may also be set in the lettuce rows, taking the place of what has been used.

Pests. Lettuce is sometimes attacked by white grubs. If the plants wilt down, dig for the grub; they may revive if the roots are not injured too severely. Dig for cutworms if plants are cut off. A dressing of nitrate of soda will be beneficial if the plants are attacked by either white grubs or cutworms. Sprinkle with water to carry the nitrate into the soil. Cabbage worms sometimes attack lettuce; they may be removed by hand picking.

Melons

Soil. Melons thrive best in a light, rich soil containing considerable sand. Make the soil in the hill fine and mix with it a shovelful or two of well-rotted manure.

Culture. Plant after all danger of frost is over, placing ten or twelve seeds in a hill. Make muskmelon hills five or six feet apart and watermelon hills eight or ten feet apart each way. Thin to three or four plants in a hill.

Cold frame. A few seeds may be planted in inverted sod in a cold frame and transplanted for early use. (See directions under "The Cucumber.")

Culture. Keep a surface mulch until the vines shade the soil.

Diseases and pests. Spray early with Bordeaux arsenate-of-lead mixture. Melons are subject to the attacks of the same destructive insects and fungous diseases as cucumbers and squashes.

Mustard

Mustard for salad may be grown on any kind of garden soil. Sow the seeds thickly in drills six inches apart. For spring use sow as early as the ground can be worked; freezing does not injure the seeds. A succession may be had by sowing every two weeks. Sow in September for fall salad or greens. For winter use it may be grown in frames or boxes, where the cold can be partially excluded.

To produce seeds for flavoring pickles and sauces, sow in April, in rows one foot apart, and thin out to three inches apart in the row when two inches high.

Onions

Varieties. Onions may be propagated from seeds, from bulbs (commonly known as sets), and from top sets (small bulbs formed on top of the flower stalk). Potato onions and multipliers are compound sets, some of whose parts may be planted; they are valuable for spring bunching. Perennial onions are hardy onions that may remain in the ground from year to year; they never form large bulbs. Their special value lies in their providing green onions for spring and fall use.

Bottom sets are best adapted to home gardens. The white ones are excellent for early green onions, and the yellow and red varieties for the main crop.

Soil. Onions need well-prepared and well-drained, rich soil. The land should be given an ample supply of well-rotted manure in the fall. If this is supplied in the spring, it must not contain coarse material that will make the earth loose. The soil for onions must be firm enough to hold the bulbs in place. Wood ashes are valuable for this vegetable, on account of the potash which it contains. Mixed fertilizers may also be used; they must be worked into the soil near the surface, for onions are not deep feeders.

Planting sets. Place sets right side up, with their tops just showing, in rows twelve inches apart and two inches apart in the row.

Sowing seeds. Sow the seeds half an inch apart or thicker, and thin to two inches apart. Cover half an inch deep and pack the soil firmly with the back of a hoe or with some flat surface.

Onions can stand considerable frost. Plant sets or sow the seeds as early in the spring as the ground can be worked.

How to grow sets. Sow seeds broadcast in a sandy seed bed. After the tops dry, pull the onions and keep them in a dry place until the next season.

Perennial onions. Plant top sets of perennial onions in the fall or in early spring. Give them a coating of manure each fall. In the spring remove the coarse part of

the manure ; the fine part that remains on the bed will improve the quality of the onions. Keep the weeds down during the summer and thin if the bunches become too thick.

Culture. Onions should be cultivated with a hand or wheel hoe after each rain. Weeds that come up in the row should be pulled before they are large enough to disturb the small roots. Onions loosened with weeds will not make a strong growth. Keep the topsoil covered with a fine dust mulch, but do not draw the earth over the bulbs.

Cold frame. Sow seeds in a cold frame in March. Make the rows six inches apart and sow the seeds thick. Some of the plants may be eaten while they are young and others may be transplanted. Transplant onions after they are well hardened and trim both tops and roots.

Harvesting. After the tops are dead, pull the onions and lay them in windrows, as indicated in Fig. 149, so that the sun can reach the roots. After the onions are dry they may be tied together by the tops and hung in a dry shed, or they may have the tops cut off and be spread out flat about four inches deep under cover. During the winter, store them in slatted boxes in a cool place. They are not injured by freezing, but they cannot endure continued freezing and thawing.

Diseases. If the land is infested with smut, sow the seeds in cold frames and transplant the seedlings after they have made considerable growth and are well hardened. Smut may be prevented by scattering in the drills

with the seeds a mixture of sulfur and air-slaked lime, two parts of sulfur to one of lime. One ounce of the mixture is sufficient for fifty feet of drill. For rust, rotate crops and spray with copper sulfate, one pound to fifteen gallons of water. Spray with Bordeaux mixture for black mold.

Fig. 149. Drying Onions in a Garden in Arlington, Massachusetts

Pests. While young the bulbs are sometimes injured by the onion maggot. As soon as the plants are up, sprinkle the soil around them with carbolic acid emulsion, and at weekly intervals, while there is danger, apply tobacco dust along the row. Burn all injured plants. Spray with kerosene emulsion for thrips. Destroy cutworms with poisoned bait.

Parsley

Parsley may be grown in the garden for summer use, or in window boxes for use during the winter. By mulching with a coating of coarse manure, the roots may be kept in the ground and yield an early supply in the spring.

Fig. 150. Parsley growing in a Window Box

Soil. Any kind of rich garden soil that has been thoroughly pulverized will produce parsley.

Sowing. Soak the seeds in lukewarm water for a few hours and sow out of doors from April to July. Make drills one foot apart and thin out the plants to four inches apart in the row. The thinnings may be either transplanted or eaten.

Cold frame. Parsley may be sown in cold frames from March to September. Make the rows six inches apart and thin the plants as needed.

Window boxes. Sow parsley in window boxes at any time of the year. It will make a good growth in the ordinary living-room temperature. The boxes must be kept in the sun near the window glass, and must be well drained. Water thoroughly, but do not let water stand in the drainage pans.

Parsley roots may be taken from the garden in the fall and transplanted to window boxes or cold frames.

Parsnips

Parsnips are a long-season crop; they occupy the ground from early spring until fall. Part of the crop may be taken up late in the fall and stored with beets, turnips, and carrots, to be used while the ground is frozen. For spring use, parsnips should be left in the ground all winter. When the frost leaves the ground, dig the parsnips as they are needed. Place the rows next to the perennials or in some place in the garden where they will not interfere with second crops or fall fertilizing and plowing.

Soil. The soil must be moist, rich, and deep, and should be manured the previous season. Commercial fertilizers may be applied at the time of planting.

Sowing. Sow as early in the spring as the weather will permit. Spade the ground to a depth of about ten

inches. Break all clods so that they will not interfere with the downward growth of the roots. With a rake make a very fine surface soil. The seeds come up slowly. Mark the rows with a few radish seeds. Sow the seeds half an inch deep in drills eighteen inches apart. Thin out so that the plants will be from three to six inches apart in the row.

Seeds. Parsnip seeds must be fresh; there is little vitality in them after the first year.

Culture. Weed and cultivate until the leaves cover the ground.

Pests. For webworms and other pests, use arsenate of lead, one tablespoonful to two gallons of water.

Peas

Varieties. The smooth-seeded dwarf varieties of peas are best for very early planting. The wrinkled-seeded kinds are not so hardy but are of better quality. There are three types of wrinkled-seeded peas — dwarf, half-dwarf, and tall, which are early, medium, and late.

Time of planting. Smooth peas should be planted as soon as the frost is out of the ground. The dwarf wrinkled varieties may be put in about the first of April. Plant half-tall and tall peas in May. By making a succession of plantings and by planting varieties that mature at different times, peas may be had during a long season. A planting of extra early peas may be made the first of August for fall use.

Soil. Soil that has been enriched with stable manure the previous season will be in good condition. The early plantings should be in light, dry soil; the late, in deep loam. An oversupply of fresh manure makes the plants run to vines.

After the vines are well started, little nodules that contain bacteria will grow on the roots. The bacteria gather nitrogen from the air in the soil and convert it into nitrates for the use of the plants.

Planting. Plant peas in double rows six inches apart. Make the space from one double row to another eighteen inches for the dwarf varieties and three feet for the tall. Early peas should be planted one inch deep and should be about one half of an inch apart in the row. Plant the later dwarf kinds about one inch apart, and the tall kinds, one inch. Scatter them in broad rows, as indicated in Fig. 151. Pack the soil firmly with the back of the hoe after planting, so that they may obtain moisture by coming in close contact with the soil. Germination may be hastened if the seeds are soaked overnight and kept in a warm place.

Culture. Thin the late varieties to three or four inches apart in the row. By means of frequent shallow cultivation, keep a mulch on the surface, to retain moisture. If a crust is formed by rain soon after planting, go over the row with a garden rake to keep the topsoil fine. Peas may be cultivated with a wheel hoe, but the space between the double rows must be cultivated with a hand hoe. Pinch off the ends of vines that grow too rank.

Support. The dwarf kinds will support each other when planted in double rows. When the peas have reached a height of about four or five inches, support tall-growing varieties with brush firmly stuck in the ground between the double rows, or stretch fencing wire about three feet

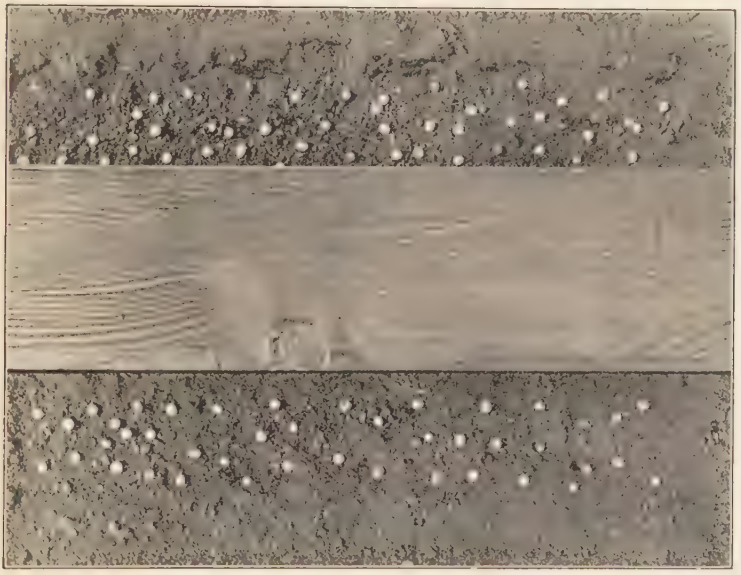


Fig. 151. A Double Row of Peas

Place a six-inch board between the rows while planting the seed

high between the double rows. Fasten the wire to stakes placed about twelve or fifteen feet apart.

Diseases. For mildew, spray with Bordeaux mixture containing a small quantity of soap to make it adhere. For blight, spray the vines with Bordeaux mixture or dust them with dry Bordeaux and keep them off the ground; rotate the crops and destroy old vines.

Pests. Spray with kerosene emulsion for plant lice. Use dry Bordeaux mixture for flea beetle. Destroy cutworms by digging for them and by using poisoned bait. The pea weevil, sometimes present in peas, lays its eggs in the pod and passes through its larval state in the pea. Only seeds that are free from weevils should be planted.

Fig. 152. Taking a Pepper Plant out of a Pot

Peppers

The pepper plant is grown for its fruit. The small varieties are used for pickling; the large kinds are often used while green for "mangoes" and stuffed peppers. Though very tender while young, the plant will not be injured by considerable frost in the autumn.

Pepper plants may be grown from the seed when all danger from frost is over, or they may be transplanted. The latter method makes the stronger plants.

Soil. Peppers need a light, warm, rich, moist soil.

Growing plants in boxes. Sow the seeds in March in a box near a window or under glass. When the

second leaf appears, transplant to other boxes. Place the plants two inches apart each way, or use four-inch flowerpots, putting one plant in each pot. In May or June set out in the garden, from twelve to eighteen inches apart each way, depending upon the variety and the method of culture.

Sowing the seed in the garden. To grow peppers from seed, plant eight or ten seeds in a hill and cover half an inch deep. Make the hills from twelve to eighteen inches apart each way and thin to one strong plant in each hill.

Culture. Keep a surface mulch of fine soil. To obtain large fruit, cut back the ends and pinch off blossoms after several good ones have started.

Supports. Use stakes for supporting the large-fruited, tall varieties.

Harvesting. Cut the fruit off the plants, leaving a short stem. The plants will continue bearing until frost.

Diseases. Spray with Bordeaux mixture for anthracnose, or cover the plants with dry Bordeaux mixture.

Potatoes

Varieties. There are both early and late varieties of potatoes. Early varieties mature more quickly than the late ones, but the yield is not so heavy. In small gardens early potatoes may be followed by late turnips or corn. Late varieties may be preceded by radishes, early turnips, or early peas. The best kind to be planted in

any given section must be learned by consulting gardeners or farmers, and is largely determined by the nature of the soil.

Soil. Potatoes require a deep, rich, light soil well supplied with humus. There must be good tilth, so that the soil will hold moisture. Heavy, low soil is usually too wet, although the late varieties will grow on heavier soil than the early ones. The subsoil must be loose, to

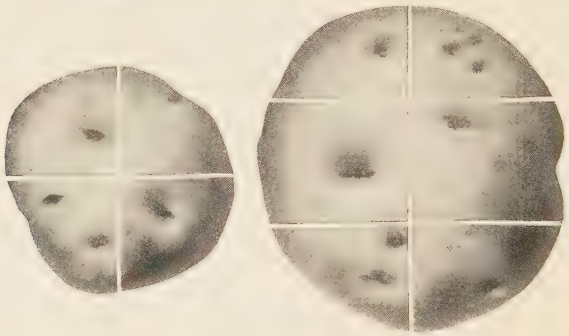


Fig. 153. Potato Cuttings. (One-half natural size)
The white lines show where the tubers should be cut

give the roots an opportunity to reach down for moisture. Fresh sod land well harrowed, and newly cleared timber land containing leaf mold, are excellent for potatoes.

Fertilizer. Do not use fresh stable manure. For early potatoes plow under a heavy dressing the previous season, or turn under a load of green manure in the fall. For late potatoes the soil may be given a coating of well-decayed manure or compost early in the spring. A mixed fertilizer, worked into the rows at the rate

of a thousand pounds per acre, will produce a better quality of potatoes and increase the yield.

Cutting. The so-called eyes on the outside of a potato are buds from which the next year's growth comes. Cut the tubers so that each piece will have at least two buds. The stem end is sometimes rejected, as it starts more slowly than the other parts. The size of the piece, rather than the number of eyes, is important in giving the new plant a good start. Potatoes which are about the size of an egg should be planted whole. Cut potatoes just before planting. If it is necessary to store them for any length of time after cutting, place them in a box covered with a damp cloth, to keep them from losing vitality. The pieces will also retain their vitality if rolled in plaster immediately after cutting.

Time of planting. Potatoes are a cool-season crop. The first planting should be made as soon as the frost is out of the ground. Plant late potatoes in June; they will make much of their growth in September, when the weather is cool.

Planting. Spade the soil to a depth of at least six inches. Break all large clods with the spade and rake the surface fine. With a hoe make trenches thirty inches apart and three inches deep; in case a fertilizer is to be used, make the trenches four inches deep. Scatter in the required amount of fertilizer and cover it with an inch of soil, so that the fertilizer will not touch the pieces of potato. Place the pieces in the trench fourteen inches apart.

Culture. With a garden rake go over the entire patch before the potatoes come up. If rains are frequent, it may be wise to do this two or three times.

Cultivate with a hand hoe or a wheel hoe after every hard rain. The early cultivation may be three or four inches deep. After the plants are in good growing condition, cultivate the surface only. When the vines begin to bloom, draw a layer of soil an inch or two deep around the plants. This will hold the moisture and keep the tubers from being exposed to the sun. Keep a loose layer of earth between the rows until the vines furnish enough shade to prevent excessive evaporation of moisture from the soil. While the potatoes are ripening, pull weeds that come up, to keep them from going to seed.

If horse power is to be used, make the rows three feet apart. Harrow the entire patch just before the potatoes come up; one good harrowing will be sufficient. Use a hand hoe to remove weeds and loosen the soil between the hills after plowing.

The yield may be increased by putting straw or manure between the rows when the plants are in good growing condition.

How to grow very early potatoes. Select an early variety and cut the tubers in the usual way. Place an inch of compost in a four-inch flowerpot. Cover the compost with an inch of sand. Place a piece of tuber, eyes up, on the sand. Fill in with sand, but leave half an inch of space for watering. Pack several pots with leaf mold in a box about four inches deep. Water well and

keep them in a moist, warm place. The pieces may also be packed close together in plots. Place an inch of compost in the plot and put on a layer of sand an inch deep. Pack the potatoes in the sand and cover them. Potatoes planted the fifteenth of March will have formed strong roots and stems by the middle of April. If a cold frame is placed over the plots, the plants will grow more rapidly.

Digging and storing. Dig potatoes as soon as the vines are dried, or let them remain in the ground until fall if the soil is dry. Do not let them lie on the ground in the sun, for this will turn them green and injure their flavor. Store them in barrels in a dry, cool cellar, and keep them away from a freezing temperature.

Diseases. Potato blight may be prevented by spraying with Bordeaux mixture, beginning treatment when the plants are about six inches high. To prevent scab, rotate the crop or soak the potatoes in formalin for two hours just before cutting, using one ounce of formalin to two gallons of water. *Allow no treated tubers to come in contact with bags or boxes where untreated ones have been kept.*

Pests. For the Colorado beetle, commonly called the potato bug, use one teaspoonful of Paris green in two gallons of water. A teaspoonful of lime may be added to increase the adhesive property of the Paris green; this also prevents the poison from burning the leaves. Apply the mixture with a common garden sprinkler or with a spray pump. A tablespoonful of arsenate of

lead in two gallons of water is another remedy; this sticks to the foliage better than Paris green. Use Bordeaux mixture for the flea beetle. Mix a tablespoonful of dry Bordeaux mixture with two gallons of water, or place dry Bordeaux mixture in a bag, or in a baking-powder can with holes punched through the lid with a small nail, and dust it onto the plants when the leaves are damp.

A teaspoonful of Paris green and a tablespoonful of Bordeaux mixture in two gallons of water is a good combination for blight, flea beetles, and potato bugs.

The Pumpkin

Varieties. For growing in the garden the sugar, or pie, pumpkin should be selected. The large kinds need a great deal of room; they may be grown with profit as a companion crop in fields of corn.

Soil. The pumpkins will thrive in any kind of soil that will produce corn. Special preparation of the hill by mixing in a shovelful of manure or a handful of commercial fertilizer will increase the yield.

Planting. The hills should be from eight to twelve feet apart, depending upon the variety, and eight or ten seeds may be put in each hill. Thin to two or three plants in a hill.

Culture. Keep the ground covered with a surface mulch until the vines cover it.

Diseases and pests. (See under "Cucumbers.")

The Radish

Varieties. The early scarlet turnip radishes and the French breakfast varieties are best for early use; they will be ready for the table in from four to six weeks. The larger half-long and long shapes are better adapted

Fig. 154. Sowing Radish Seeds
The seeds should be scattered in wide rows

to summer use; they grow more slowly and therefore keep in good condition for a greater length of time.

Time of planting. The spring varieties should be sown as early as the soil can be worked, and for a succession, every week or ten days. Summer varieties may be sown in May and June. Some of the early kinds may be sown late in August for fall use.

Soil. The soil for early radishes should be light. Well-decayed barnyard manure worked into the land in the fall will put it in good condition. Fresh stable manure has a tendency to make radishes go to leaves at the expense of roots. For very early sowing, select a well-drained, sunny slope; the later sowings will do best in a cool, moist place. Work the soil fine to a depth of four inches for the early round type and six inches for the long type.

Sowing. Sow the early radishes in drills six inches apart and thin to about two inches in the row. Sow summer and winter radishes in drills twelve inches apart and thin to three or four inches. The depth should be half an inch, early in the spring, when the ground is moist, and one inch later in the season. If the ground is dry, pour water in the drills before the seeds are sown and cover them with fine soil. During hot weather, moisture may be held in the soil by laying a board or a gunny bag over the row for two or three days.

Culture. Thin early, so that the roots of remaining plants will not be disturbed. Keep the soil fine by cultivating with a rake after every rain. If the land should break up in small clods, crush them with the back of a hoe.

Transplanting. Radishes may be transplanted when the fourth leaf is formed. By selecting the strongest plants and setting them deeper than in the seed bed, a good quality of root may be obtained. Shade the plants for a day or two.

Winter radishes. Sow winter radishes in June. Dig them in the fall and store them in sand in the cellar or in a pit. Soak winter radishes in cold water for an hour before eating.

Cold frame. Sow radish seeds in cold frames at any time from the middle of March to early in September. Bottom heat must be avoided. The day temperature should be from 65 degrees to 75 degrees, while that at night may go as low as 40 degrees.

Pests. For root maggot, give the soil a dressing of wood ashes or of tobacco dust after sowing. Practice rotation and do not sow the late varieties near the early ones.

Spinach

Sow in September for the earliest spinach. After heavy frosts set in, cover with leaves or straw. Remove the cover early in the spring.

Sow the spring crop as early as possible; when peach trees begin to bloom is a good time. The spinach will not be injured by freezing. For a succession sow every two weeks. Spinach may be sown in August for fall use.

Soil. A warm, light, rich soil gives the best results. A dressing of nitrate of soda raked in just before sowing will help the crop.

Sowing. Sow in drills a foot apart; cover the seeds half an inch deep if the soil is moist, or one inch deep when the soil is dry. Make the earth firm above the seeds with the back of a hoe.

Culture. Keep a loose layer of soil on the surface of the ground. Pull weeds by hand while they are small. Thin to about two inches apart.

Harvesting. Keep thinning and using the plants until they stand about six inches apart in the row. Use the largest leaves of the plants that are left on the ground. Two or three pickings may be had from the same plant.

Cold frame. Plants may be started in cold frames and set out later. Spinach for either early spring or late fall use may be grown in cold frames.

Disease and pests. Use rotation and clean culture as a protection against disease and pests

The Squash

Varieties. There are two kinds of squash — the bush and the running varieties. The bush varieties are mostly for summer use. The running varieties produce larger fruit; they should be planted as the main crop for fall and winter use.

Soil. The squash may be grown on any kind of soil, provided the hills are in good condition. Spade up a space two feet in diameter and ten or twelve inches deep. Mix one or two shovelfuls of well-rotted manure with the soil. A handful of commercial fertilizer may also be put into the hill, but do not let it touch the seeds.

Planting. Plant when all danger from frost is over. Make the hills of the bush varieties from three to four

feet apart, and the hills of the running varieties from eight to ten feet apart. Plant ten or twelve seeds in a hill and cover them one inch deep. When danger of loss by insects is over, thin to three plants in a hill.

Fig. 155. Squash growing as a Companion Crop with Corn

The squash may be grown successfully as a companion crop with corn, as shown in Fig. 155.

Cold frame. Start squash in cold frames in inverted sod, in pots, in tin cans that have the sides cut open, or in berry boxes.

Culture. Keep a good surface mulch over the entire patch until the ground is entirely covered with vines; this will prevent excessive evaporation of moisture.

To produce large fruit, pinch off blossoms after two or three have set; the ends of vines may also be pinched back.

Harvesting. Cut off summer squash as soon as they ripen. The winter varieties are ready for gathering as soon as the stems become dry and shrunken. Remove them from the vines, being careful to leave two inches of stem on each squash. Turn the white side to the sun for two or three days, then store them in a dry cellar where the temperature does not go below 40 degrees. Do not bruise the fruit while handling.

Diseases. For mildew and wilt, spray with Bordeaux mixture, or cover the leaves with dry Bordeaux.

Pests. If the large squash bug, sometimes called stink bug, attacks the vines, protect the vines with frames or pick the bugs off by hand. The old bugs may also be trapped under boards. Pick off patches of eggs by removing them together with the part of the leaf to which they are attached; they are usually found on the underside. Kill young bugs by dusting them with air-slaked lime or with tobacco dust.

To repel the squash-vine borer throw a handful of air-slaked lime or tobacco dust close around the vines. If the vines are already infested, split them lengthwise and destroy the borers. Cover the injured part with soil.

To protect the vines from the striped cucumber beetle use frames, dust the plants with air-slaked lime, or spray early with Bordeaux arsenate of lead mixture.

Sweet Corn

Varieties. The kinds of sweet corn may be classed as early, medium, and late. The ears may be eaten in from sixty to ninety days, depending upon the variety. The size of the ear also depends upon the kind. The earliest sweet corn has a low stalk with small ears; it is best adapted to small gardens, as it does not shade other crops so much as the large varieties.

Soil. Sweet corn will grow on many different kinds of soils, but it is at its best when planted in a deep, rich loam well fertilized with barnyard manure. The dressing may be put on either in the fall or in the spring; it must be well scattered and spaded or plowed under. A mixed fertilizer applied to the soil before planting, at the rate of from a thousand to fifteen hundred pounds per acre, will increase the yield. It may be scattered broadcast or put in the hill while planting.

Time of planting. The seeds will rot in the ground when it is cold and wet, but it is wise to plant a few hills of one of the earliest varieties soon after the frost is out of the ground. If another planting is made in two weeks, there will be no serious loss if the first planting is unsuccessful. Soak the seeds for several hours and plant on a bright day. All of the different kinds may be planted at about apple-blossom time. By making a careful selection of varieties a succession may be provided for the summer. About the first of July plant one of the medium-early varieties for fall use.

Planting. Plant in rows thirty inches apart and have the hills two feet apart. Stretch a line the full length of the row and remove soil with a hoe for the hills, breaking any clods that may be in the way. Drop in ten or

FIG. 156. Corn grown on Experimental Plots by Pupils of the Griggsville (Illinois) Public Schools

To test the value of commercial fertilizers, plant corn on two adjacent plots. Give one plot an application of fertilizer at the rate of six hundred pounds per acre, and apply no fertilizer to the other plot. The following formula may be used: nitrate of soda, ten pounds; fine, dry loam, twenty pounds; acid phosphate, sixty pounds; and sulfate of potash, ten pounds. Mix the fertilizers thoroughly before applying. A twelve by sixty foot plot will require about ten pounds of fertilizer

twelve kernels, distributing them so that they will lie an inch apart; cover them to a depth of one inch. Later in the season, after the ground becomes warm and drier, plant five or six grains in a hill and cover them two inches

deep. In case a fertilizer is used, scatter it in the hill and cover it with an inch of soil before planting the corn. A row of radishes or spinach may be grown between the corn rows.

Culture. Cultivate after every rain. The roots of corn are near the surface, so do not hoe too deep around the hill. Preserve a surface mulch. After the plants have made a good start, thin to four strong plants in each hill. A dressing of nitrate of soda or liquid manure will cause a strong growth. Rake in the nitrate of soda around the hill, but do not let it touch the plants.

Pop corn. The directions for growing pop corn are the same as for sweet corn.

Field corn. Field corn is usually planted in hills three feet eight inches apart each way. Plant three grains in a hill. It may be cultivated to a depth of four or five inches while it is small. After it has grown to be eighteen inches high, cultivation must be shallow to avoid injuring the network of fine roots between the rows. A dust mulch should be kept on the surface.

Diseases. If dark masses of fungous growth, called smut, make their appearance, collect and burn them. Do not fertilize the land with manure from cattle which have been fed with corn infested with smut. If the seed is taken from a field which contains smut, soak it for one hour in a solution of one ounce of formalin to two gallons of water.

Pests. Use poisoned bait for cutworms. Rotate the crop for the many other pests that attack corn.

The Sweet Potato

Sweet-potato plants may be grown from roots in hotbeds or in window boxes in sand or fine soil. Cover the roots to a depth of two inches and keep moist but not too wet. They may be grown at home or in schoolrooms at the ordinary temperature. Start them about a month before the plants are to be set out. After they are four or five inches long, pull them without disturbing the roots. The same roots will continue yielding sprouts.

Soil. Sweet potatoes grow best on rich, light, sandy soil. Before the plants are set out, the soil may be given a dressing of barnyard manure; they may be planted on level soil, but some prefer growing them on ridges made by throwing two furrows together.

Setting out plants. Plants may be set eighteen inches apart, keeping three feet between the rows. They should be set some deeper than in the sprouting box or hotbed. Water the plants as they are set out. Transplant on a cloudy day if possible. Shading the vines for a day or two will give them a vigorous start.

Culture. Keep a surface mulch over the ground until the vines cover it, and pull any weeds that may come up.

Harvesting. Leave the roots in the ground until frost. Much growing is done late in the season. When frosts set in, cut off the vines with a hoe; the crop may be dug later. Sweet potatoes that have had the vines injured by frosts will lose much of their flavor. Store the roots in boxes of sand in a dry cellar out of the reach of frost.

Diseases. Use Bordeaux mixture for leaf diseases. If the roots are subject to rot, do not use the same land next year.

Pests. Kill cutworms with poisoned bait. Use Bordeaux mixture and arsenate of lead for the flea beetle.

The Tomato

Plants. Tomato plants should be started in window boxes or under glass about the fifteenth of March or the first of April, so that they will be ready for the garden when all danger of frost is over. The soil should consist of equal parts of sand, well-rotted barnyard manure, and loam. The seeds should be covered with about a fourth of an inch of soil. After covering, water them through a cloth and cover the box with a pane of glass. Keep the box in a warm place for three or four days; then place it in a sunny window, as near the glass as possible. Turn it daily to keep the seedlings from growing to one side, and move it away from the window on cold nights.

After the second leaf makes its appearence, transplant to another box, placing the seedlings two inches apart each way, or put them in four-inch flowerpots. One strong plant should be put in each pot. Set them deeper than they stood in the seed bed, as shown in Fig. 128. The soil should contain considerable coarse manure. To make the stem stronger, pinch out the top bud when the seedlings are four or five inches in height. If the plants growing in boxes are to be planted late, on account of succeeding other crops, they may be

transplanted a second time. They should be set three or four inches apart, either in boxes or in the garden. It is none too late to place them in their permanent positions after they have grown to be twelve or fifteen inches high. When transplanting, parts of some of the longest leaves should be removed. Large plants may be set five or six inches deep.

Soil. The soil should be fertilized the previous season, for fresh stable manure will delay the time of fruiting. If the soil is not in good condition, work in a spadeful of old manure to a depth of at least a foot. A dressing of nitrate of soda, applied at the rate of about two hundred pounds per acre, will help give the plant a good start.

Distance. The distance apart the plants are to be set will depend upon the variety and whether they are to be grown on supports or allowed to spread over the ground. Those grown on supports may be put two feet apart in the row; the rows should be three or four feet apart, depending upon the variety. Plants not supported should be set four feet apart each way.

Method of training. Untrained vines give a lighter yield, and much of the fruit is likely to rot during the wet seasons. A good method of supporting vines is to set posts eight feet apart along the rows and fasten them to wires, as indicated in Fig. 157. The end posts must be well braced, so that the wires will not become slack. Three or four two-inch strips of board may be used instead of the wires. Another good way is to tie the plants to stakes. Well-sharpened stakes about two

inches in diameter and five feet in length should be driven into the ground. They should be set at least six inches from the plants, so that the roots will not be injured. The vines should be tied up with raffia, or strings made out of strips of cloth; twine is likely to cut them. Care must be taken not to wrap them so tightly as to interfere with their growth. The training should start before the plants begin to trail on the ground. Continue tying them up as they grow.

Fig. 157. Tomato Vines supported with Posts and Wires

Pruning. If the vines are to be supported by wooden or wire trellises, three stems may be permitted to grow; all other side shoots should be pinched off. Remove all the side shoots of plants that are to be fastened to stakes. The time of fruiting may be hastened by pinching off all subsequent blossoms after three clusters of fruit have set. If the fruit is too much shaded, leaves should be removed;

this applies especially to plants allowed to grow without support. About the first of September cut off all growing tips and all blossoms.

The vines may be protected from early frosts by covering. Green tomatoes may be matured by pulling up the vines and hanging them in a shed or a dry cellar. The fruit may also be ripened in boxes.

Diseases. For blight, spray the plants with Bordeaux mixture, change the location, and burn all vines after they become dry in the fall. For rot, prune the vines so that all parts may be reached by sun and air, and spray with Bordeaux mixture. For scab, keep the plants off the ground and spray with Bordeaux mixture.

Pests. Hand picking is the best remedy for the large green tomato worm, which frequently eats the leaves and young fruit. If the stems are weakened by the tomato borer, cut the larvæ out of the affected parts.

Turnips

For spring use, sow as early as possible after the frost leaves the ground. The quality depends upon their growing during the cool season. Sow again late in July; turnips will not suffer from frost in the fall.

Sowing. Sow the seeds sparingly in drills one foot apart, and cover half an inch deep. They will come up quickly. Thin to three or four inches apart. A succession of the early varieties may be obtained by sowing every two weeks until June.

The late crop may follow peas, onions, or early potatoes. Sow just before a shower. Make the soil fine and scatter the seeds broadcast, raking them into the soil.

Culture. Cultivate the early varieties like any other root crop. The late kinds will need no cultivation, except that it may be necessary to pull troublesome weeds as they make their appearance.

Diseases. Rotate to guard against clubroot. The flat varieties that grow mostly above the ground are not troubled with this disease as much as the deeper-growing varieties.

Pests. For root maggot, dress heavily with tobacco dust or with unleached wood ashes after sowing. For flea beetle use Bordeaux mixture, arsenate of lead, or kerosene emulsion.

Asparagus

With proper care a bed of asparagus may last from fifteen to twenty years. It should be kept at one side of the garden, where it will not interfere with plowing and the cultivation of annual crops. Low-growing crops, such as radishes, lettuce, and carrots, may be grown between the rows the first and second years.

Soil. The soil must be well drained, rich, and light. Sandy soil heavily manured will grow good asparagus.

Growing roots from seeds. Sow the seeds in the spring — the earlier the better, after the frost is out of the ground. Soak the seeds overnight before planting. Place them an inch apart, in drills eighteen inches apart, and

cover them with an inch of soil. They come up slowly. Mark the rows with a few radish seeds and cultivate before the asparagus seeds come up. Thin the plants to not less than three inches apart and cultivate during the entire summer. Cover with litter in the fall and set the roots in their permanent place the next spring.

Transplanting. Dig trenches three feet apart and eighteen inches deep, and in the bottom tramp six inches of well-rotted manure. Cover this with six inches of good garden soil; that taken from the bottom of the trench must not be used. Set the plants eighteen inches apart and spread the roots carefully. Fill in soil around the roots and water to help the operation; then fill the trench. If the soil is heavy, do not fill the trench more than half full, but put the rest in gradually while cultivating during the spring and summer.

Time may be saved by buying roots. Seedsmen who have special skill in growing plants may be able to furnish stronger roots than those grown in the home garden.

Culture. With a garden rake go over the plot at least once each week until the shoots reach the surface of the soil. Then cultivate between the rows and pull weeds near the plants by hand. Keep the surface soil loose during the entire summer.

In the fall clear off and burn the tops and apply a good coating of manure. The manure should be as free from weed seeds as possible. In the spring, fork the manure into the soil. The plants should be set deep enough so that the whole bed may be spaded. Continue

cultivating between the rows during the first and second years. The third year a heavy coating of coarse manure may be applied after the spring cultivation. The manure will fertilize the soil and help retain the moisture. Keep the plot free from weeds.

Harvesting. If the plants have been kept in good condition, a light cutting may be taken the second year after the roots have been set. Cut or break the stalks off two or three inches below the surface of the soil. Do not cut too late in the season. The yield of any year will depend upon the food that has been supplied by the top during the preceding summer.

Pests. Let some plants grow up and spray them either with Paris green or arsenate of lead to kill any asparagus beetles that feed on them.

Rhubarb

Six or eight rhubarb plants, if given proper care, will yield enough stalks for family use.

Rhubarb may be grown from seed, but it is more profitable to buy strong roots of a good variety. Old plants may be separated. The roots may be cut into as many pieces as there are strong buds. Leave as much root as possible with each bud. Parts of a plant may be taken up and transplanted while some of the root remains in the ground undisturbed.

Soil. Rhubarb requires a deep, rich soil, but that found in any garden will answer the purpose, provided the hill is given special preparation.

Planting. Loosen up the soil with a spading fork to a depth of two feet, preparing a space two feet in diameter. The earth should be at least one third well-rotted manure. Set the plants so that the buds will be two or three inches below the surface, three feet apart. Give each plant two gallons or more of water, so that the fine soil will come immediately into close contact with the roots.

Culture. Cultivate during the entire summer, to retain the moisture. Onions or some surface-feeding crop may be set out near the plants, to pay for the labor of cultivating during the first year.

Mulching. In the fall, cover the plants with a heavy mulch of coarse manure, to prevent deep freezing. They will live through the winter without the mulch, but will yield stalks much earlier the next spring if it is applied. Rake off the coarse material early in the season and fork the fine material into the soil for humus and fertilization.

Forcing. Force the plants by placing over them a bottomless box or barrel. Pile a heavy coating of fresh manure around it.

Rhubarb may be forced in a cool cellar. Let the roots freeze thoroughly for a month or more; then take them up and pack them in rich earth in the cellar. Cover the plants three inches deep and keep them moist. When the shoots appear, water more freely.

If the roots used for forcing in a cellar are set in the garden and given the usual attention, they will regain strength for a crop in two years.

Parts for forcing may be cut from old plants that have become too thick. With a sharp spade cut through the root without disturbing the part to be left in the ground. The cut must be made deep in order to get all of the heavy roots containing the nourishment for the stalks.

Harvesting. Some stalks may be taken the second year. Begin harvesting early in the spring. Never take away all of the leaves, for they must supply the food to the roots for the next year's crop. Remove the stalks with a quick downward and outward pull.

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